BRITISH
AIRWAYS

BRITISH
AIRWAYS

1-11

Flying Manual

ATP No. 2411

Serial No. ....

Holder No. ....

This Manual complies with ANO (1989) Article 26, BCAR A7-3, CAP 360 and Technical Services Procedure T-DON-02-05. The inclusion of an uncertified revision will invalidate this certification.

Signed .... General Manager Flt. Tech. Services and where applicable, on behalf of Chief Engineer Technical Services.

Date ....1 APRIL 91........ CAA Approval No. DAI/8566/78

This publication forms part of the British Airways approved Operations Manual
Prepared and issued by Technical Information Services, G2, TBA, LHR, S401.

REVISION RECORD

Rev. No.	Date Entered	Initials	Rev. No.	Date Entered	Initials	Rev. No.	Date Entered	Initials
1-4	Incorporated							

LETTER OF TRANSMITAL - REVISION No.4
AND
LIST OF EFFECTIVE PAGES

Issued by: TECHNICAL INFORMATION SERVICES, BRITISH AIRWAYS, G2, TBA, S401, LONDON (HEATHROW) AIRPORT, P.O. BOX 10, HOUNSLOW, MIDDLESEX.

This revision complies with ANO (1985) Article 25, BCAR A6-7, CAP 360 and Technical Services Procedure T-DON-02-05

Approved Design Signatory ....

INSTRUCTIONS

1. Insert new or revised pages of those references against which the word INSERT appears. Remove and destroy any page of the same reference as a new page is being inserted.
2. Remove and destroy any page of the reference against which the word REMOVE appears.
3. Record the incorporation of this revision on the REVISION RECORD at the back of the manual.

The completeness of the manual should be checked against the listed page-sequence. The currency of each individual page should be checked against its listed revision date.

LIST OF EFFECTIVE PAGES

Title Page/Revision Record			INSERT
CAA Exemption			22 MAY 85
EFFECTIVE PAGES			
0-0	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
SUMMARY OF CONTENTS			
0-1	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
CONTENTS			
0-1			15 OCT 88
PART 1 NORMAL PROCEDURES			
FLIGHT HANDLING			
1-1	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	v/vi	01 APR 91
	INSERT	vii/viii	01 APR 91
	INSERT	ix/x	01 APR 91
	INSERT	xi/xii	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91
	INSERT	25/26	01 APR 91
	INSERT	27/28	01 APR 91
	INSERT	29/30	01 APR 91
	INSERT	31/32	01 APR 91
	INSERT	33/34	01 APR 91
	INSERT	35/36	01 APR 91
	INSERT	37/38	01 APR 91
	INSERT	39/40	01 APR 91
	INSERT	41/42	01 APR 91
	INSERT	43/44	01 APR 91
	INSERT	45/46	01 APR 91
	INSERT	47/48	01 APR 91
	INSERT	49/50	01 APR 91
	INSERT	51/52	01 APR 91
	INSERT	53/54	01 APR 91
	INSERT	55/56	01 APR 91
	INSERT	57/58	01 APR 91
	INSERT	59/60	01 APR 91
	INSERT	61/62	01 APR 91
ADVERSE WEATHER OPERATION			
1-2	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91

	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91
	INSERT	25/26	01 APR 91
	INSERT	27/28	01 APR 91
	INSERT	29/30	01 APR 91

PERFORMANCE CONSIDERATIONS

1-3	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91

OPERATING POLICY

1-4	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91
	INSERT	25/26	01 APR 91
	INSERT	27/28	01 APR 91
	INSERT	29/30	01 APR 91
	INSERT	31/32	01 APR 91
	INSERT	33/34	01 APR 91

B1-11 AMPLIFIED CHECKS

1-5	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91

S1-11 AMPLIFIED CHECKS

1-6	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91

B1-11 FCS & RADIO

1-7	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91

S1-11 FCS & RADIO

1-8	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91

PART 2 ABNORMAL PROCEDURES

AIR CONDITIONING & PRESSURISATION

2-1	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91

ELECTRICS

2-2	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91

ENGINES

2-3	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	v/vi	01 APR 91
	INSERT	vii/viii	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91
	INSERT	25/26	01 APR 91
	INSERT	27/28	01 APR 91
	INSERT	29/30	01 APR 91

FUEL

2-4	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91

HYDRAULICS, FLYING CONTROLS & GEAR

2-5	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	v/vi	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91
	INSERT	25/26	01 APR 91
	INSERT	27/28	01 APR 91

	INSERT	29/30	01 APR 91
	INSERT	31/32	01 APR 91
	INSERT	33/34	01 APR 91
ICE & RAIN PROTECTION			
2-6	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	1/2	01 APR 91
B1-11 FCS & RADIO			
2-7	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	v/vi	01 APR 91
	INSERT	vii/viii	01 APR 91
	INSERT	ix/x	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
S1-11 FCS & RADIO			
2-8	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	iii/iv	01 APR 91
	INSERT	v/vi	01 APR 91
	INSERT	vii/viii	01 APR 91
	INSERT	ix/x	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
SMOKE			
2-9	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
WINDOWS & DOORS			
2-10	INSERT	0	01 APR 91
	INSERT	i/ii	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
EMERGENCY PROCEDURES			
2-11	INSERT	0	01 APR 91
	INSERT	1/2	01 APR 91
	INSERT	3/4	01 APR 91
	INSERT	5/6	01 APR 91
	INSERT	7/8	01 APR 91
	INSERT	9/10	01 APR 91
	INSERT	11/12	01 APR 91
	INSERT	13/14	01 APR 91
	INSERT	15/16	01 APR 91
	INSERT	17/18	01 APR 91
	INSERT	19/20	01 APR 91
	INSERT	21/22	01 APR 91
	INSERT	23/24	01 APR 91

1.2 ADVERSE WEATHER

WINDSHEAR

1-2-3 **The Windshear section has been completely rewritten, please read.**

ICE & RAIN

1-2-8 Warning of the possibility of clear ice forming on the wing upper surface and consequent danger of ingestion added.

TAKE-OFF FROM CONTAMINATED RUNWAYS - UNIFORM FLOODING LESS THAN 3mm DEEP

1-2-11 Maximum crosswind component of 12 kt added - as given in the Performance Manual.

TAKE-OFF FROM CONTAMINATED RUNWAYS - SLUSH OR SNOW

SLUSH less than 3mm deep or extremely dry snow less than 12mm deep

1-2-13 Maximum crosswind component amended to 12 kt and 6 kt if the cleared width is less than 36 m - as given in the Performance Manual.

APPROACH AND LANDING

1-2-16 Conditions for selection of windscreen heat to 'High' added.
Minimum cleared width of 30 m added - as given in the Performance Manual.

LANDING DISTANCES

1-2-17 More information added - as given in the Performance Manual.

VERY SLIPPERY RUNWAYS

1-2-17 Conditions when V_{AT} landing should be carried out added.

GO AROUND

1-2-18 The go around procedure from an approach to a contaminated RWY is amended to conform with the normal go around procedure, ie relights off at 1500ft.

APPROVED AIRCRAFT DE-/ANTI-ICING FLUIDS

1-2-20 Fluids approved and fluid categorisation amended.
1-2-25 Remote de/anti-icing procedures detailed.
1-2-28 FICO information on de-icing added.

VOLCANIC ASH

1-2-29 Advice on operations in areas subject to volcanic eruptions added - You never know!

1.4 OPERATING POLICY

CO-PILOTS HANDLING DURING TAKE-OFF AND LANDING

1-4-2 Converting or newly promoted Captains may now authorise Co-pilots to handle take-offs and landings or P1CUS after 10 sectors in command.

CO-PILOTS OPERATING P1CUS

1-4-2 New section detailing when Co-pilots may operate as P1CUS.

COMMUNICATIONS

1-4-3 Section on communication with Cabin Crew and use of seat belt/no smoking signs added.

TAKE-OFF

1-4-6 Section added to give policy on flap and thrust selection. Basically, the greatest flap setting available should be used unless this precludes the use of reduced thrust.

REJECTED TAKE-OFF

1-4-6 Criteria for "STOP" amplified, but no change in policy.

ALTITUDE ALERT SETTING

1-4-9 New section.

RECORDS TO BE MAINTAINED

1-4-10 Requirement to retain the loadsheet added.
Late Close-Out Procedure added. This includes the procedure for calculating V_{MO} which was not given in the FCN.

OPERATION OF THE AIR CONDITIONING SYSTEM ON THE GROUND

1-4-12 New section reflecting the policy that a pilot or an engineer must remain on the aircraft while the air conditioning system is in use and on the flight deck if it is in use with passengers on board.

ALLOCATION OF DUTIES

Rejected Take-off

1-4-16	Some information moved to new Rejected Take-off section in the Emergency Procedures.

Final Approach

1-4-25	Amended to reflect the policy set out in FCO 1655. This permits a P2 to continue with an autoland in Cat 3a conditions if the Captain is incapacitated.

SUMMARY OF STANDARD CALLS

1-4-28	Numerous changes reflecting common usage and Training Department requirements.

FUEL ECONOMY

1-4-33	New Section summarising advice.

1.5 B1-11 AMPLIFIED CHECKLIST

FULL CHECKS

1-5-2	APU starting amended to take account of alternative marks of APU.
1-5-3	Weight Schedule included in Aircraft Library.
1-5-3/4	Emergency Equipment fit amended to reflect new standard.

Centre Instrument Panel

1-5-5	B1-11(400) TVI check added.

EXTERNAL

1-5-14	Requirement for crew to be particularly alert to leakage from forward toilet/water servicing points added.

START

1-5-17	Requirement to trip B1-11(400) generators deleted.

DESCENT

1-5-21	Rad alt, autoflare, IFM - reference to revised check in FCS procedures section added.

AFTER LANDING

1-5-23	Checklist amended to reflect policy that APU air need not always be used for conditioning.

1.6 S1-11 AMPLIFIED CHECKLIST

FULL CHECKS

1-6-2	APU starting amended to take account of alternative marks of APU.
1-6-3	Weight Schedule included in Aircraft Library.
1-6-3	Emergency Equipment fit amended to reflect new standard.

DESCENT

1-6-21	Rad alt, autoflare, IFM - reference to revised check in FCS procedures section added.

AFTER LANDING

1-6-23	Checklist amended to reflect policy that APU air need not always be used for conditioning.

1.7 B1-11 FCS PROCEDURE

The requirement to compare autothrottle speed readout with the ASI readout before engaging the autopilot has been deleted. This is not a Flight Manual requirement. However, the Flight Manual requirement to check that the autothrottle select speed readout approximates to that of the P1 ASI before engaging the autothrottle has been added.

PRIOR TO DESCENT (AUTOLAND OR CAT 2 MANUAL LANDING)

1-7-2	Section added giving Rad alt, Autoflare and IFM check.

STANDARD ILS APPROACH

1-7-3	Amended to allow autothrottle to be engaged after selecting 45^0 flap.

1.8 S1-11 FCS PROCEDURES

The Flight Manual requirement to check that the autothrottle select speed readout approximates to that of the P1 ASI before engaging the autothrottle has been added.

PRIOR TO DESCENT (PRIME LAND APPROACH)

1-8-2	Section added giving Rad alt, Autoflare and IFM check.

STANDARD ILS APPROACH

1-8-5	Amended to allow autothrottle to be engaged after selecting 45^0 flap.

ABNORMALS

Circuit Breakers	In the abnormal checklists, where crews are invited to 'check' a circuit breaker, they may also reset it. If they are merely to observe if a CB is tripped, or it may not be reset, this is specifically stated.
References	Where there is a reference to another section/checklist, a box is added to the right of the reference. ▨
B1-11(400)	Information on this aircraft has been included in this manual including CB numbers. This information has not been included in the 500 series aircraft QRH as the B1-11(400) has a separate QRH.

2.1 AIR CONDITIONING AND PRESSURISATION

EMERGENCY DESCENT

2-1-1 **Revised procedure.** Requirement to make the cabin address **"THE DESCENT IS NOW COMPLETE, WILL THE SENIOR CABIN CREW MEMBER REPORT TO THE FLIGHT DECK"** when it is safe for the cabin crew to move about the aircraft added. The Cabin Crew Manual instructs cabin crew to remain seated until this announcement is made.

SLOW DEPRESSURISATION/FAILURE TO PRESSURISE

2-1-2 **Revised procedure.** This was previously the SLOW DEPRESSURISATION checklist. Items have been added to cater for the situation where the aircraft fails to pressurise after take-off.

DESPATCH WITH U/S COOLING FAN

2-1-8 Procedure amended to reduce pressure surges. The dump valve is manually opened before take-off and slowly closed after both air conditioning systems have been selected to OPEN.

DESPATCH WITHOUT PRESSURISATION

2-1-10 Additional considerations added.

2.2 ELECTRICS

CSDS FAILURE - B1-11 400 SERIES ONLY

2-2-1 Note that CSDS fail lights have been deactivated on the S1-11 and B1-11 (500 Series), hence the checklist only applies to the B1-11 (400).

TOTAL GENERATOR FAILURE

2-2-3 Emergency lights to be switched Off if likely to remain airborne for more than 10 mins added.

B1-11 Instruments Available With All Generators Failed

2-2-8 Rad Alt and Compass Indicator positions reversed to reflect the revised B1-11 standard fit.

2-2-9 **Revised procedure.** Emergency lights Off included in the After Take-Off & Climb Checklist. Emergency lights On included in the Landing Checklist. This is to ensure that Emergency lights are available after landing.

AC BUS FAILURE

2-2-10/11 Symptoms amended to include all possibilities.

OLEO WEIGHT SWITCH FAILURE

2-2-12 **New checklist added.**

2.3 ENGINES

LIMITATIONS

ENGINE

2-3-i Revised OP NEC power parameters for the S1-11 included. Now EGT 535^0C N2 12200. Note the conditions under which it may be used and the requirement to make a Tech Log entry.

APU

2-3-iv Limitations for alternative APUs included.

2-3-v Above FL170, the APU may **NOT** be used to support airconditioning (Flight Manual Limitation).

ENGINE FAILURE - AFTER ENGINE SHUTDOWN

2-3-1 The requirement to be lower than FL200 and below 240 kt before starting the APU deleted. This restriction only applies if the aircraft has both engine driven generators unavailable.

APU FIRE

2-3-2 **Revised procedure.** Check amended to be less ambiguous.

ENGINE OVERHEAT/FIRE OR APU FIRE ON START

2-3-2	**Revised procedure.** Amended to reflect deletion of B1-11 low air pressure warning system. "Firebell - Cancel" added. APU items amended to be consistent with revised APU fire checklist.

ENGINE MALFUNCTION ON TAKE-OFF

2-3-3	REJECTED TAKE-OFF DRILL moved to EMERGENCY PROCEDURES section.

CONTINUED TAKE-OFF AFTER ENGINE MALFUNCTION

2-3-5	Possibility of a genuine Mode 2A GPW at certain airfields even if the correct procedures followed discussed.

IMMEDIATE RELIGHT

2-3-16	The requirement to be lower than FL200 and below 240 kt before starting the APU deleted. This restriction only applies if the aircraft has both engine driven generators U/S. This restriction is already included under LIMITATIONS.

ENGINE VIBRATION

2-3-20	**Revised procedure.** Simplified.

ENGINE - ABNORMAL INDICATIONS DURING START

2-3-21/22	**Checklists rewritten.**
2-3-22	B1-11(500) checklist for "Low Air Pressure Lamp Illuminated" deleted.

STARTING WITH EXTERNAL AIR SUPPLY

2-3-23	Amended to include all of normal start checklist down to ENGINEERS CLEARANCE.

APU

2-3-27	Checklists amended to include alternative APUs.

DESPATCH WITH U/S APU

Air System Handling

2-3-28	**Revised procedure.** Checklist amended to reduce pressure surges. If engine air bleeds must be switched OFF for take-off, the dump valve is fully opened manually before take-off and closed slowly after the master valves have been selected OPEN.

2.4 FUEL

BOOSTER PUMP FAILURE

2-4-1 Note added that if a rear booster pump is inoperative and the associated wing tank contents are below 2500kg a nose up attitude greater than 12° may give LP warnings, but the engine should not loose power at low altitude.

2.5 HYDRAULICS

FLYING CONTROLS

HYDRAULIC SERVO FAIL

2-5-5 **Revised procedure.** HYDRAULIC CUT OFF LEVER(S) - OFF. Now memory items.

MANUAL REVERSION

2-5-6 **Revised procedure.** Layout improved - hopefully!

TEST FLYING AT OUTSTATIONS

2-5-12/14 Rewritten.

S1-11 ONLY - FLIGHT WITH FLAPS LOCKED UP

2-2-25 Maximum crosswind component deleted (included in error).

GEAR

ABNORMAL INDICATIONS ON GEAR RETRACTION OR SELECTOR LEVER LOCKED DOWN.

2-5-27 **Revised procedure.** Checklist renamed from ABNORMAL INDICATIONS ON GEAR RETRACTION.
Initial checklist items now memory.
Checking of Gear Lever Lock CBs added.

AUTO BRAKE REMAINS ON & RESIDUAL BRAKE PRESSURE

2-5-28 Reference to GEAR, TYRE OR BRAKES DEFECT ON GROUND added.

2.6 ICE AND RAIN PROTECTION

LIMITATIONS

Windscreen heating limitations moved to WINDOWS & DOORS.

AIRFRAME ANTICING VALVE FAILED OPEN

2-6-1 Checklist amended to indicate more clearly that there is no restriction on continued flight with an airframe antice valve failed OPEN. However, the air supply to that valve should be shut off prior to landing.

2.7 B1-11 FCS AND RADIO

B1-11 LIMITATIONS

AUTOFLIGHT CONTROL - GENERAL LIMITATIONS

2-7-i Amended to reflect the Flight Manual requirements for autopilot engagement. These do not include checking the autothrottle select speed readout.

ILS COUPLED APPROACH CAT 2 AND AUTOMATIC LANDING CAT 2

2-7-iii Amended to reflect the policy that a single engine Cat 2 approach should only be carried out if the engine failure did not occur during the cruise, unless asymmetric flight in excess of 1 hour would be required to reach a suitable aerodrome forecasting Cat 1 weather or better.

AUTOTHROTTLE

2-7-iv The Flight Manual requirement that a check be carried out that the autothrottle select speed readout approximates to that of the P1 ASI before engaging the autothrottle added.

AUTOPILOT STATUS PLACARDS

2-7-vi CAT 1 AUTOLAND status deleted. The Engineering regrading procedure has been changed, but this does not affect crew procedures. Note the "Tech Log Entries" section.

ALTIMETER TOLERANCES

2-7-ix Those for the B1-11(400) added.

ASI TOLERANCES

2-7-ix Included.

DISCONNECT WARNING LIGHTS ON STEADY WHEN AUTOPILOT ENGAGED

2-7-1 **Revised procedure.** In this case the autopilot is downgraded to CAT 1 MAN LAND. The disconnect lamp must be monitored as an automatic disconnect will extinguish the lamp but there will be no audible warning.

AUTOPILOT WILL NOT DISENGAGE

2-7-2 **Revised procedure.** AUTOPILOT MASTER SWITCH - OFF now a memory item.

AUTOTRIM WARNING LIGHT ON

2-7-2 **Revised procedure,** to conform with Flight Manual.

ASI FAILURE

2-7-6 B1-11(400) pitch attitude/ power/ speed table added.

ALTITUDE ALERT

2-7-7 Moved to INSTRUMENTS Section to conform with S1-11.

400 SERIES RADIO & ELECTRONIC POWER FAILURES

2-7-9 New checklist.

COMMS

SERVICE INTERPHONE FAILURE CHECK

2-7-10 New checklist.

2.8 S1-11 FCS AND RADIO

S1-11 LIMITATIONS

AUTOFLIGHT CONTROL - GENERAL LIMITATIONS

2-8-i Amended to conform with Flight Manual requirement for checks prior to autopilot engagement. There is no requirement to check that the indications in the select speed window approximates to that of the P1 ASI unless speed lock or autothrottle are to be selected. The S1-11 FCS procedures for autopilot engagement have not been amended, as the above check needs to be carried out to determine whether the speed lock is available.

ILS COUPLED APPROACH CAT 2 AND AUTOMATIC LANDING CAT 2

2-8-iii Amended to reflect the policy that a single engine Cat 2 approach should only be carried out if the engine failure did not occur during the cruise, unless asymmetric flight in excess of 1 hour would be required to reach a suitable aerodrome forecasting Cat 1 weather or better.

AUTOTHROTTLE

2-8-iv The Flight Manual requirement that a check be carried out that the autothrottle select speed readout approximates to that of the P1 ASI before engaging the autothrottle added.

AUTOPILOT STATUS PLACARDS

2-8-vi CAT 1 AUTOLAND status deleted. The Engineering regrading procedure has been changed, but this does not affect crew procedures. Note the "Tech Log Entries" section.

ASI TOLERANCES

2-8-ix Included.

AUTOPILOT

2-8-5 **New checklists.** Autopilot malfunction section added.

ALTITUDE ALERT

2-8-10 **New checklist.** Failure checklist added.

2.9 SMOKE

2-9-4 Services lost and instruments **NOT** available included for the various power situations.

2.10 WINDOWS AND DOORS

LIMITATIONS

Various limitations added. Windscreen heating limitations moved from ICE & RAIN PROTECTION.

WINDSCREEN HEATING FAILURE

2-10-4 Maximum altitude of 25,000 ft deleted (included in error).

2.11 EMERGENCY PROCEDURES

REJECTED TAKE-OFF

2-11-1 Procedure moved to this section from ENGINES. **B1-11 (500) new procedure.** The forward booster pumps will be selected OFF after **all** rejected take-offs.

EVACUATION PROCEDURES

2-11-3 **"THIS IS AN EMERGENCY. EVACUATE, EVACUATE"** has the phrase ' and if necessary **"HAZARD AT......"** added to conform with Company policy.

2-11-4 Advice included to marshal the passengers away from the aircraft (at least 100m), upwind and clear of the main wheel axle line after an evacuation.

TYPES OF EMERGENCY LANDING/DITCHING

UNPLANNED

2-11-6 **Revised Procedure.** With a landing imminent, the Captain will call over the PA - **"THIS IS THE CAPTAIN, THIS IS AN EMERGENCY BRACE BRACE".**

EMERGENCY LANDING CHECKLIST

2-11-7 **Revised procedure.** Amended to include planned and unplanned emergency landings and ditchings.

MINIMUM RWY LENGTHS FOR ABNORMAL LANDING SITUATIONS

2-11-8 Data for B1-11(400) added.

DITCHING CHECKLIST

2-11-11 **Revised procedure.** Tripping of GPWS added to checklist.
Shutting down of engines after impact becomes a memory item.

HIJACK CHECKLIST

2-11-13 **NEW SECTION.** WILL ALSO BE ADDED TO QRH.

RED (SPECIFIC) BOMB THREAT IN FLIGHT CHECKLIST

2-11-14 **NEW SECTION.** WILL ALSO BE ADDED TO QRH.

RED (SPECIFIC) BOMB THREAT ON GROUND CHECKLIST

2-11-15 **NEW SECTION.** WILL ALSO BE ADDED TO QRH.

FIRST AID

2-11-16 Contents list for Emergency Kits deleted, in common with other fleets. This information is included in the Flying Staff Medical Manual.

GPWS "PULL UP" WARNING CHECKLIST

2-11-20 **Revised Procedure.** Action in the event of a false warning added. The Captain is specifically instructed to inhibit the system if he is certain that a warning is false.

NOTE ADDED THAT IF GPW IS DUE TO WINDSHEAR, WINDSHEAR GO-AROUND CHECKLIST SHOULD BE USED.

WINDSHEAR GO-AROUND CHECKLIST

2-11-21 **Revised Procedure.** Now included in QRH.

ALL ENGINE FAILURE CHECKLIST

2-11-22 **Revised procedure.** Initial actions are now memory items. Details of the checklist have been amended and additional advice included.

VOLCANIC ASH CHECKLIST

2-11-24 **New checklist**, including some memory items, for use should the aircraft inadvertently enter a volcanic ash cloud. WILL ALSO BE ADDED TO QRH.

CONTENTS

LIMITATIONS 1-1-i

GENERAL 1-1-1
  Control Forces
  Recommended Trimming Procedure
  Stability and Trim Changes
BEFORE STARTING 1-1-2
  Check Lists
STARTING, PUSHBACK, POWERBACK 1-1-3
  Starting
  Tail Pipe Fires (Flames)
  Start During Push-back
  Push-Back Technique
  Powerback
TAXYING 1-1-8
TAKE-OFF 1-1-10
  Weather Minima
  Take-off Thrust Settings
  Noise Abatement Power:
  'Power set'
  Check Start
  Take-Off Flap Setting
  Normal Take-Off
  Take-off through Water, Slush or Snow
  Low Visibility
  Crosswind Take-off
  Severe Turbulence
INITIAL CLIMB 1-1-14
EN-ROUTE CLIMB 1-1-16
  Standard Procedure
  Maximum Rate of Climb
  Maximum Gradient Climb
  Operational Necessity Climb Power
FUEL MANAGEMENT 1-1-17
CRUISE 1-1-18
  Normal Cruise
  Maximum Range Cruise
  Fuel Management
  Fuel Checking
  Head/Tailwinds
DESCENT 1-1-19
  Standard Procedure
  Steep Descents
  Approaching Safety Height + 3,000ft.
  Intermediate Approach
  Holding

APPROACH 1-1-22
- General
- ASI Indices
- Radio Decision Heights
- Autothrottle

ILS APPROACH 1-1-24
- Intercepting the GP
- Cat 1
- Cat 2 and Cat 3a

NON-PRECISION APPROACHES 1-1-27
- Localiser only, VOR, NDB.

RADAR APPROACH 1-1-28
- PAR and SRA approach

CLOUD BREAK 1-1-29
VISUAL APPROACHES (MANUAL) 1-1-29
ALTERNATIVE APPROACHES 1-1-30
- Fuel Economy Approach
- 26° Flap Approaches

APPROACHING DECISION HEIGHT 1-1-31
GO-AROUND 1-1-31
LANDING 1-1-33
- Reverse Thrust
- Landing with 26° Flap
- Crosswind Landing
- Tailwind Landing
- Landing in Turbulent Conditions
- Autolanding
- Landing in Low Visibility
- Landing Bounce and Recovery
- Landing Run/Roll Out
- Taxying after Landing

RECOMMENDED PROCEDURES

- S1-11 1-1-37
- B1-11 1-1-49

LIMITATIONS

Weights	S1-11	B1-11(OLE)	B1-11(NLE)	B1-11(400)
Max Taxying	41950	41950	44000	37999
Max Take-off	41950	41950	44000	37999
Max Landing	39000	39000	39460	35380
Max Zero Fuel	35381	36740	36740	32205

Dimensions	1-11 500	1-11 400
Span	93ft 6in	88ft 6in
Length	107ft 0in	93ft 6in
Height	24ft 6in	24ft 6in
Wheelbase	41ft 5in	33ft 1in
Track (to gear centres)	14ft 3in	14ft 3in

Max Crosswind Components

TAKE-OFF	
Normal conditions	30kt
Standing water/snow/slush	See Adverse Weather Section
LANDING	
Normal conditions	30kt
Slippery and/or very wet	20kt
Braking action poor	10kt

Wet runway - If runway width less than 43m or landing distance less than 1750m reduce landing limits by 5kt.

Max Tailwind Components

Set out below are the maxima authorised for the aircraft. Reduced maxima are applied to many runways - see Performance Manual.

	Normal	Slippery
Take-off	10kt	0
Landing	15kt	10kt

Auto Approach Wind Limits

	Autoland	Cat 2 Man Land
Max wind	23kt	23kt
Max X/wind	10kt	15kt
Max tail wind	5kt	10kt

Speeds

Minimum V_1	1-11 500	95kt
	1-11 400	98.5kt

V_{MO}	S1-11 510	ZFW above 35000	323kt
		ZFW 34001-35000	325kt
		ZFW 33000-34000	330kt
		ZFW below 33000	333kt
	B1-11 500 except G-BGKE/F/G	ZFW above 34700	317kt
		ZFW below 34700	327kt
	G-BGKE/F/G	ZFW above 36000	317kt
		Increases 5kt/1000 until ZFW 29000	
		ZFW below 29000	352kt
	B1-11 400	ZFW above 29000	340kt
		ZFW below 29000	353kt

M_{MO}	1-11 500	0.77
	1-11 400	0.78

If mach trim inoperative, unless autopilot fully serviceable and engaged, $M_{MO} = 0.72$

High Speed Warning Bell

S1-11	336 - 345 kt	0.775 - 0.79 M
B1-11 (539)	352 - 364 kt	0.775 - 0.79 M
B1-11 (400)	356 - 365 kt	0.785 - 0.80 M
B1-11 (other)	330 - 339 kt	0.775 - 0.79 M

Rough Air	1-11 500	280kt below 28700ft
		0.72M above 28700ft
	1-11 400	270kt below 31000ft
		0.72M above 31000ft

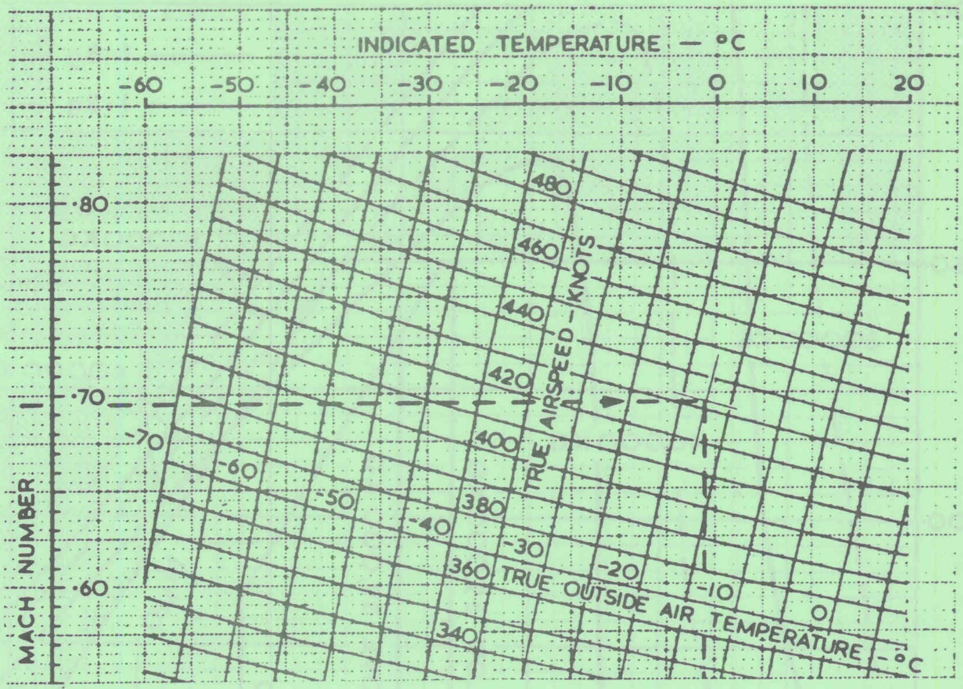
Max DV Window Opening	170kt

Max Operating Temperature

1-11 500	ISA + 30°C
1-11 400	ISA + 35°C

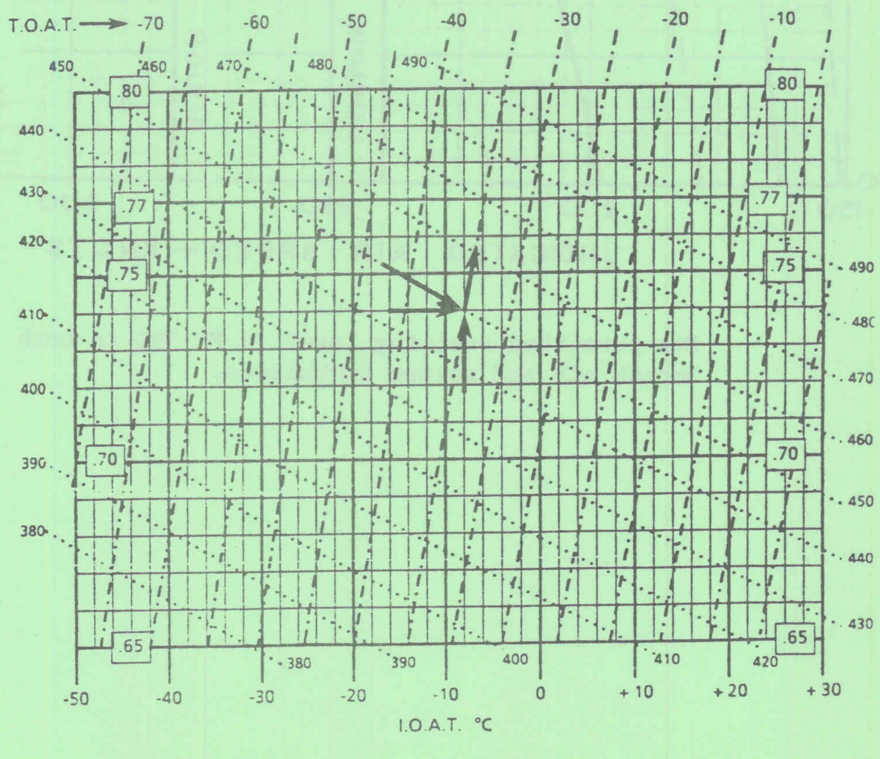
IMN v IOAT / TAS & TOAT CONVERSION GRAPH

S1-11

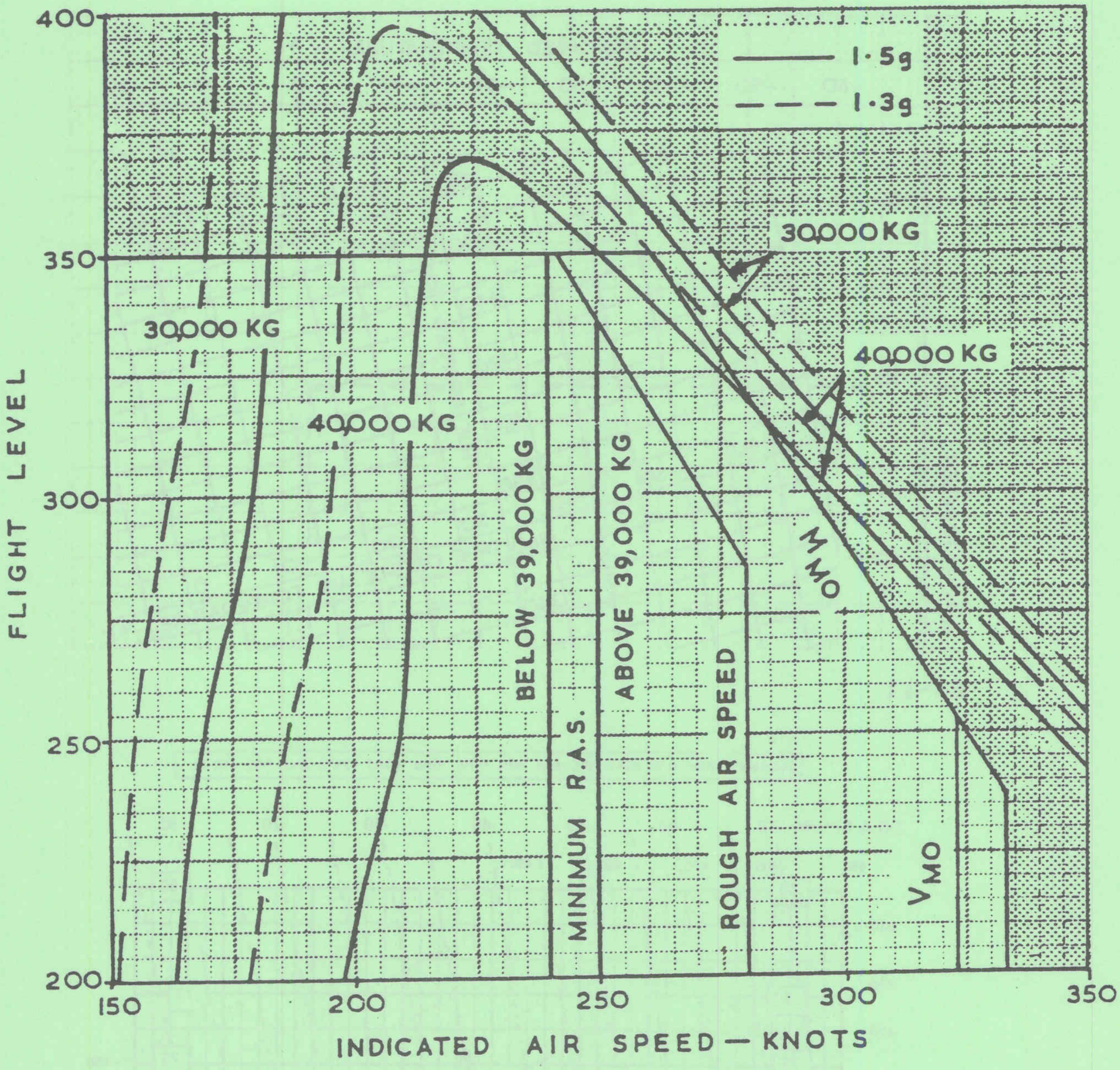


B1-11

Example: Enter with IOAT -8°C and IMN 0.74, find TOAT -35°C and TAS 450 kt



HIGH ALTITUDE LIGHT BUFFET BOUNDARY 500 SERIES A/C



Max permitted cruising level is FL 350 in both smooth air and severe turbulence.

TAKE-OFF AND LANDING REFERENCE SPEEDS 500 OLE A/C

A/C Weight	18° flap VR	18° flap V2	8° flap VR	8° flap V2	VFU	ERC	45° VAT	26° VAT
28.5-29.0	105	118	112	125	156	181	110	118
29.0-29.5	106	118	113	125	157	182	111	119
29.5-30.0	107	119	114	126	158	183	112	120
30.0-30.5	108	120	115	127	159	184	113	121
30.5-31.0	109	121	116	127	161	187	114	122
31.0-31.5	110	122	118	128	162	188	115	123
31.5-32.0	112	123	119	129	163	190	115	124
32.0-32.5	113	124	120	130	164	191	116	124
32.5-33.0	114	125	121	131	165	193	117	125
33.0-33.5	115	126	122	132	166	194	118	126
33.5-34.0	116	127	123	133	167	195	119	127
34.0-34.5	117	128	124	134	167	197	119	128
34.5-35.0	118	129	125	135	168	198	120	129
35.0-35.5	120	130	127	136	169	200	121	130
35.5-36.0	121	131	128	138	170	201	122	131
36.0-36.5	122	132	129	139	171	202	123	132
36.5-37.0	123	133	131	140	173	204	124	133
37.0-37.5	124	134	132	141	174	205	125	133
37.5-38.0	125	135	133	142	175	206	125	134
38.0-38.5	126	136	134	143	176	208	126	135
38.5-39.0	128	137	136	144	177	209	127	136
39.0-39.5	129	138	137	146	178	210	128	137
39.5-40.0	130	139	138	147	179	211	129	137
40.0-40.5	131	140	139	148	180	213	129	138
40.5-41.0	132	141	140	149	181	214	130	139
41.0-41.5	133	142	141	150	182	215	131	140
41.5-42.0	135	143	143	151	183	216	132	141
42.0-42.5	136	144	144	152	184	217	132	142
42.5-43.0	137	145	145	153	185	219	133	143
43.0-43.5	138	146	146	154	186	220	134	144
43.5-44.0	139	147	147	155	187	221	135	145
44.0-44.5	140	148	148	156	188	222	136	146
44.5-45.2	141	149	149	157	189	223	137	147

Continued take-off after engine failure.

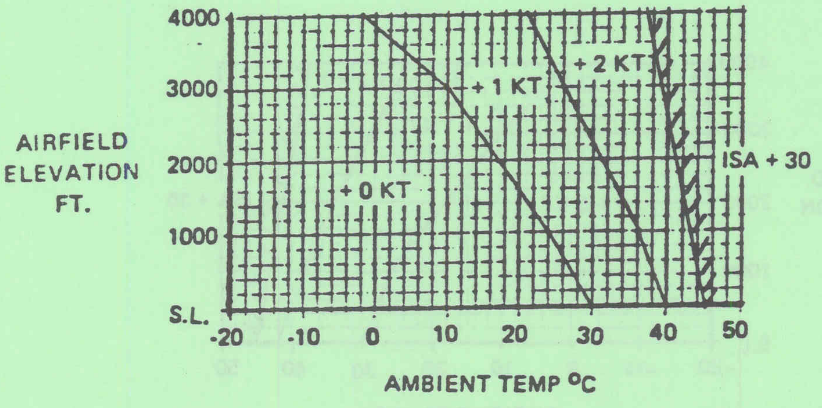
At Ha:

18° flap take-off Raise flaps to 8° at V_2+8kt

Raise flaps to 0° at V_2+25kt

8° flap take-off Raise flaps to 0° at V_2+20kt

Airfield elevation and temperature correction to be added to V_R



TAKE-OFF AND LANDING REFERENCE SPEEDS 500 NLE A/C

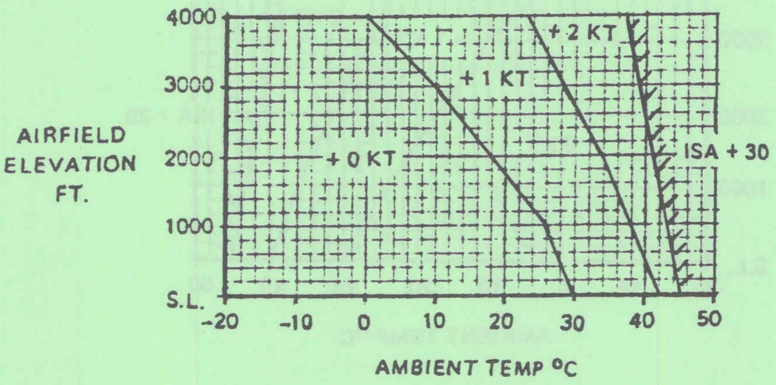
A/C Weight	20° flap		13° flap		6° flap				45°	26°
	VR	V2	VR	V2	VR	V2	VFU	ERC	VAT	VAT
Up to 29.5									109	117
29.5-30.0									110	118
30.0-30.5	105	116	110	120	115	126	150	186	111	119
30.5-31.0	107	117	111	121	117	127	151	187	112	120
31.0-31.5	108	118	112	122	118	128	152	188	113	121
31.5-32.0	109	119	113	123	119	129	153	190	113	122
32.0-32.5	110	120	114	124	120	130	154	191	114	123
32.5-33.0	111	121	115	125	121	131	155	193	115	124
33.0-33.5	112	122	116	126	122	132	157	194	116	125
33.5-34.0	113	123	117	127	123	133	158	195	117	126
34.0-34.5	114	124	119	128	124	134	159	197	118	126
34.5-35.0	115	125	120	129	126	135	160	198	118	127
35.0-35.5	116	125	121	130	127	136	161	200	119	128
35.5-36.0	117	126	122	131	128	137	162	201	120	129
36.0-36.5	118	127	123	132	129	138	163	202	121	130
36.5-37.0	119	128	124	132	130	139	164	203	122	131
37.0-37.5	120	129	125	133	131	139	165	205	122	132
37.5-38.0	121	130	126	134	132	140	166	206	123	133
38.0-38.5	122	131	127	135	133	141	167	207	124	133
38.5-39.0	123	131	128	136	134	142	168	209	125	134
39.0-39.5	124	132	129	137	135	143	169	210	125	135
39.5-40.0	125	133	130	138	136	144	170	211	126	136
40.0-40.5	126	134	131	139	137	145	171	212	127	137
40.5-41.0	127	135	132	139	138	146	171	214	128	138
41.0-41.5	128	136	133	140	139	147	172	215	128	138
41.5-42.0	129	136	134	141	140	148	173	216	129	139
42.0-42.5	130	137	134	142	141	148	174	218	130	140
42.5-43.0	131	138	135	143	142	149	175	219	131	141
43.0-43.5	132	139	137	144	142	150	176	220	131	142
43.5-44.0	133	140	138	145	143	151	177	221	132	142
44.0-44.5	134	141	139	146	144	152	178	222	133	143
44.5-45.2	135	142	140	147	145	153	179	223	134	144

Continued take-off after engine failure.

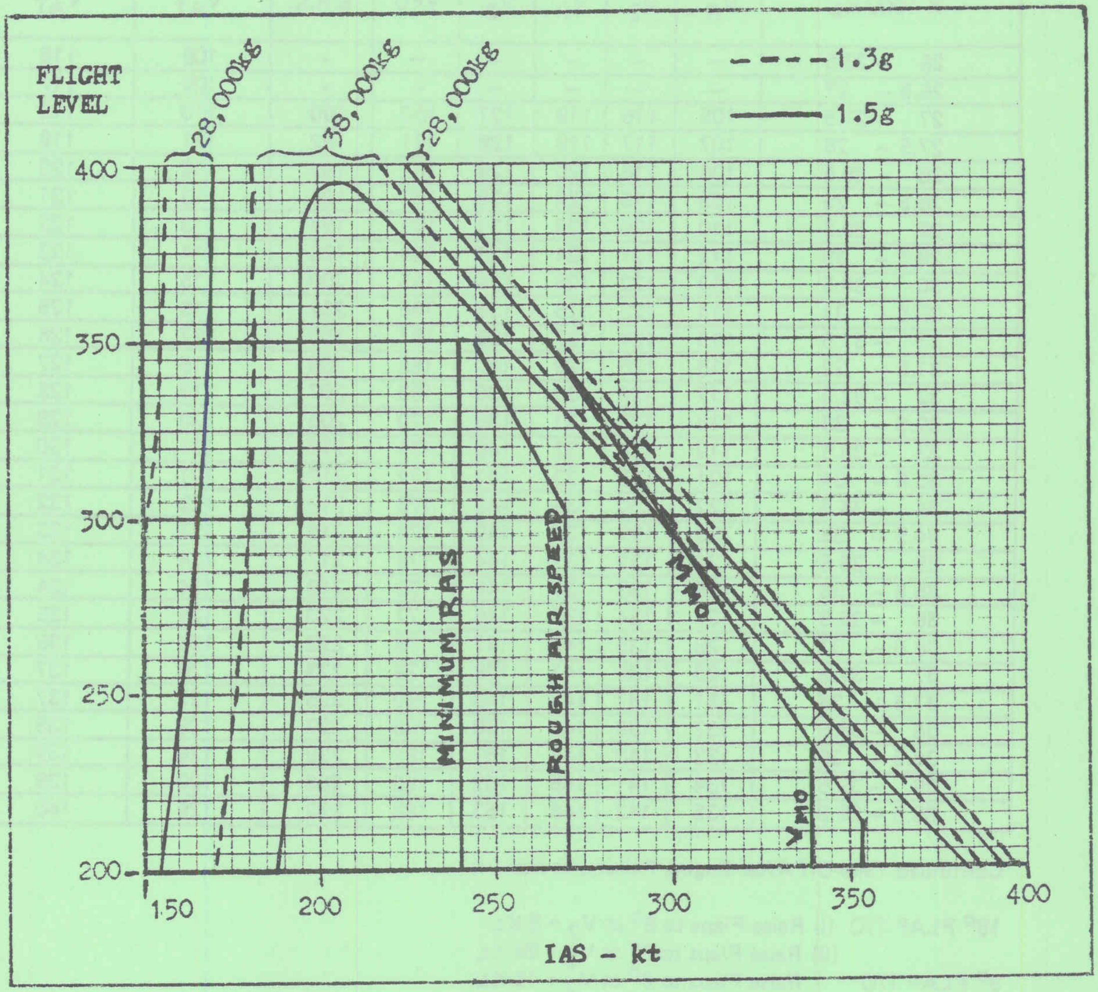
At Ha:

20° flap take-off	Raise flaps to 6° at V_2+10kt
	Raise flaps to 0° at V_2+25kt
13° flap take-off	Raise flaps to 6° at V_2+10kt
	Raise flaps to 0° at V_2+20kt
6° flap take-off	Raise flaps to 0° at V_2+15kt

Airfield elevation and temperature correction to be added to V_R



HIGH ALTITUDE LIGHT BUFFET BOUNDARY 400 SERIES A/C



Max permitted Cruise Level – FL 350 in both
severe turbulence and smooth air.

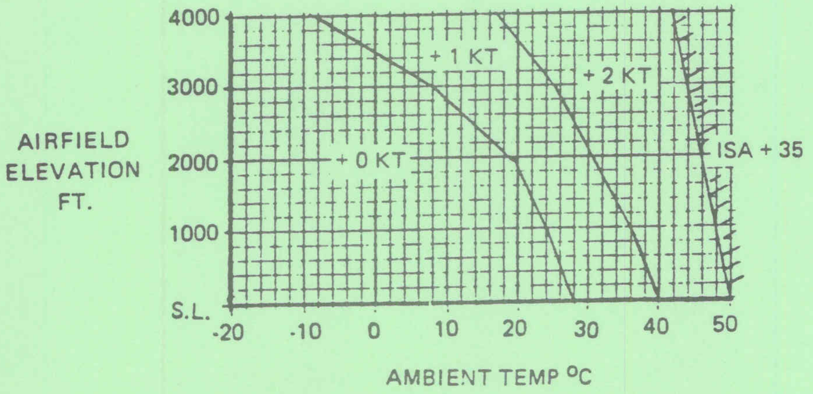
TAKE-OFF AND LANDING REFERENCE SPEEDS 400 A/C

AIRCRAFT WEIGHT X 1000 Kg.	18° FLAP		8° FLAP		VFU	E.R.C.	45° FLAP V_{AT}	26° FLAP V_{AT}
	V_R •	V_2	V_R •	V_2				
26 – 26.5	–	–	–	–	–	–	108	116
26.5 – 27	–	–	–	–	–	–	109	117
27 – 27.5	105	116	118	127	160	190	110	118
27.5 – 28	107	117	119	128	161	192	111	119
28 – 28.5	108	118	120	129	162	193	112	120
28.5 – 29	109	119	122	130	163	195	113	121
29 – 29.5	110	120	123	131	163	197	113	122
29.5 – 30	112	121	124	133	164	198	114	123
30 – 30.5	113	122	125	134	165	200	115	124
30.5 – 31	114	123	126	135	166	202	116	125
31 – 31.5	115	124	127	136	167	203	117	126
31.5 – 32	116	125	129	137	168	205	118	127
32 – 32.5	117	126	130	138	169	207	119	128
32.5 – 33	118	127	131	139	170	208	120	129
33 – 33.5	119	128	132	140	171	210	121	130
33.5 – 34	121	129	133	141	172	212	121	131
34 – 34.5	122	130	134	142	173	213	122	132
34.5 – 35	123	131	135	143	174	215	123	133
35 – 35.5	124	132	137	144	175	217	124	134
35.5 – 36	125	133	138	145	176	218	124	134
36 – 36.5	127	134	139	146	177	220	125	135
36.5 – 37	128	135	140	147	178	222	126	136
37 – 37.5	129	136	141	148	179	223	126	137
37.5 – 38	131	137	142	149	180	225	127	137
38 – 38.5	132	139	143	150	180	227	128	138
38.5 – 39	133	140	144	151	181	228	128	139
39 – 39.5	134	141	145	152	182	230	129	139
39.5 – 39.9	135	142	146	153	183	232	129	140

Continued Take-Off After Engine Failure, at Ha:—

18° FLAP T/O (i) Raise Flaps to 8° at V_2 + 8 Kt.
(ii) Raise Flaps to 0° at V_2 + 20 Kt.
8° FLAP T/O Raise Flaps to 0° at V_2 + 15 Kt.

*Airfield Elevation and Temperature Correction to be added to Tabulated V_R



FERRY FLIGHTS - EXTENDED AFT CG

If operating with a crew of only two pilots, see also Operating Policy 1-4-32.

The use of an extended aft CG limit is not permitted on B1-11s except the 539.

The conditions for accepting an aircraft trim between the normal aft limit and the extended 'Aft limit positioning flights only' limit or for accepting a DCS 'Ferry' loadsheet are as follows:

1. Maximum crosswind for take-off and landing is 20kt.
2. Autopilot coupled approaches are prohibited.
3. No passengers for hire/reward.
4. Max take-off weight:
   S1-11 - 35716kg
   539 - 35833kg
5. Take-off tailplane trim:
   S1-11 - 1.0 nose down
   539 - 1.0 nose down
6. S1-11:
   The weight of any centre tank fuel carried as ballast must be included in the ZFW and not planned to be used in flight.
7. 539:
   Plan to land with at least 2000kg fuel.

The DCS Ferry Loadsheets have the following type designations:-

S1-11 - F1A
539 - F1B

They will include the comment "FERY EXT CG".

WAKE TURBULENCE SEPARATION

The following is the ICAO standard. Variations may be applied by ATC authorities in individual states.

Aircraft Categorisation

Aircraft are categorised according to their Maximum Certified Take-off Weight:-

HEAVY	136,000 kg or more
MEDIUM	More than 7,000 kg and less than 136,000 kg
LIGHT	7,000 kg or less

Radar Separation Minima

The following apply to a 1-11 following another type:-

Leading A/c HEAVY	5 nm
Leading A/c MEDIUM/LIGHT	3 nm

Non Radar Separation Minima

ARRIVING AIRCRAFT

For timed approaches, a 1-11 should land at least 2 mins after a HEAVY aircraft.

DEPARTING AIRCRAFT

A minimum of 2 mins separation should be applied when a 1-11 is taking -off behind a HEAVY type, when the aircraft are using:-

a) the same RWY;
b) parallel RWYs separated by less than 760 m;
c) crossing RWYs if the projected flight paths cross;
d) parallel RWYs separated by 760 m or more, if the projected flight paths cross.

The above separation should be increased to 3 mins when taking off behind a HEAVY type from:-

a) an intermediate part of the same RWY; or
b) an intermediate part of a parallel RWY separated by less than 760 m.

Displaced Landing Threshold

A separation minimum of 2 mins should be applied between a 1-11 and a HEAVY type, when operating from a RWY with a displaced landing threshold when:-

a) a departure follows a HEAVY arrival; or
b) an arrival follows a HEAVY departure, if the projected flight paths are expected to cross.

Opposite Direction

A separation minimum of 2 minutes should be applied between a 1-11 and a HEAVY type making a missed approach when:

a) using an opposite direction RWY for take-off; or
b) landing on the same RWY in the opposite direction, or on a parallel opposite direction RWY separated by less than 760 m.

APPROACH SPEED CATEGORY

The 1-11 is Cat C.

FIRE & RESCUE

The ICAO Fire and Rescue category for the 1-11 is 6. This is determined by the fuselage dimensions.

The ICAO **airfield** category requirement is determined by the fuselage dimensions and frequency of movement of the largest aircraft using that airfield.

Airfields promulgated category 5 may be used when the movement rate is sufficiently low. Temporary airfield depletions to category 4 are acceptable.

AERODROME PAVEMENT BEARING STRENGTH ACN/PCN

The ACN (Aircraft Classification Number) PCN (Pavement Classification Number) system provides a method of classifying pavement load bearing capabilities.

ACN refers to the particular aircraft. It is a number expressing the relative effect of an aircraft load on a pavement for a specific subgrade (subsoil) strength.

PCN refers to the particular pavement. It is a number expressing the bearing strength of a pavement for unrestricted operations.

For normal operations, the PCN should be equal to or more than the ACN.

The following table gives ACNs for 8 weights depending on type of pavement and subgrade (linear interpolation is permitted):-

AIRCRAFT CLASSIFICATION NUMBERS

Weight kg	Rigid Pavement Subgrades A	B	C	D	Flexible Pavement Subgrades A	B	C	D
43550	29	31	32	33	26	27	30	32
39000	25	27	28	29	23	23	26	28
24700	15	16	16	17	13	13	15	17

where the letters A - D refer to the support strength category of the pavement.

A pavement will be coded in the following form:-

XXXX	The PCN
R/F	Rigid / Flexible
A/B/C/D	The support strength category of the pavement
W/X/Y/Z	The maximum tyre pressure in psi W = no limit X = 217 Y = 145 Z = 73
T/U	Method of pavement evaluation (not of use to crew)

Example

For a pavement coded PCN 80/R/B/W/T, it will be seen from the above table that operations will be unrestricted up to max TOW, the highest ACN being 31.

FLIGHT HANDLING

GENERAL

Control Forces

Aileron control forces on the ground are imposed by torsion bars and apparent stiffness of the ailerons at the extremes of travel can be a function of the gust damper. This can be overcome by light continuous pressure towards the central position. Subsequent loads are proportional to the combination of aerodynamic loading and spring tab.

Elevator and rudder forces in flight depend upon feel unit loads.

The aircraft has no artificial yaw damping, other than that provided when the auto-pilot is engaged. Dutch roll should not normally develop, and may be damped with normal control application.

Recommended Trimming Procedure

Care should be taken when trimming the rudder, as mis-trimming can significantly increase the total drag. The maximum amount of rudder trim during normal flight should be limited to 1 division of the trim scale. In engine-out and asymmetric fuel conditions more trim may be used, but care should be taken to avoid violent use of rudder, particularly at high speeds. The aileron trim is only properly effective provided that it is applied to overcome residual lateral stick force with the wings held level by the control wheel. If an attempt is made to trim the aircraft by using aileron trim alone to correct bank error, large amounts of trim could be applied with little or no apparent effect.

1. Autopilot - Disengage.
2. Elevator trim tab - Check indicated Zero.
3. Fly aircraft manually, wings level.
4. Trim out rudder, aileron, elevator, in that order.
5. Check 3-axis trim and slip indicators.

Stability and Trim Changes

Trim changes, due to operation of the gear, speedbrakes, or changes of power, are small and are easily held with the control column. However, the speed brakes should normally be extended and retracted slowly at higher speeds to avoid transient nose-up and nose-down pitch changes, respectively. There may be a slight transient rolling motion as the spoilers extend due to initial asymmetric extension. There is a transient pitch change rather late in the flap travel when selecting flaps from 0° to 18° (NLE 20°). The aircraft pitches up when the flaps run from 26° to 45° and forward pressure is required to maintain the glidepath: speed will decay rapidly unless power is applied. At extreme forward c.g. positions, the elevator control forces are rather heavy.

BEFORE STARTING

Check Lists

If any of the following apply, the full checks must be completed.

1. The Full Shutdown check items have been actioned.
2. Defect rectification has been carried out and the Captain cannot confirm that the rectified equipment has been fully checked and all affected switches and controls have been returned to the correct pre-flight positions.
3. First flight of the day.

Provided none of the above applies, the Turnround Checks may be used.

The external check should be completed prior to every flight. If any hatch, cowling or access panel, other than the doors and cargo holds, are observed to be unsecured or there is any maintenance work in progress, ensure that the engineer confirms that all are secure before departure. The aircraft must be free from ice; frost limits are given in the Adverse Weather section. Note that ice deposits can occur near the fuel tanks at any time of the year.

STARTING, PUSHBACK

Starting

The starting sequence will be actioned by the Handling Pilot. The Non Handling Pilot will ensure that the correct sequence is followed.

Tail Pipe Fires (Flames)

If the engineer observes a tail pipe fire developing he will advise **"tail pipe flames observed No. .... engine"**. The objective is to direct the flight crew towards a tail pipe fire procedure rather than an engine fire procedure.

Tail pipe fires have not been a problem on Speys fitted to 1-11 Aircraft. However, if tail pipe flames are observed then the recommended procedure is to keep the engine running and monitor the flames. If there are other signs of engine malfunction (eg a fire warning) the appropriate drill should be carried out.

Start During Push-back:

1. The APU must be serviceable.
2. A continuous intercom link should be maintained between the Engineer and the Handling Pilot.

Push-Back Technique

Push-back may be initiated either whilst starting or after engine starting. Starting during push-back will be the standard operation on pier stands, but the option to start before push remains where local conditions or taxiway congestion demand.

When the Handling Pilot advises that the aircraft is ready for start and push or for push-back, the Engineer will, having removed the GPU and chocks, check the taxiway is clear and call **"Release brakes"**. The Handling Pilot will check the brakes are released and call **"Brakes released"**, ensuring that hands and feet are kept clear of the rudder bars and steering tillers.

When the aircraft has stopped after push-back, the Engineer will call **"Set brakes to park"**. The Captain will apply the handbrake and the Handling Pilot will call **"Brakes to park"**. While the Engineer is reconnecting the torque links the steering handwheels and rudder pedals must not be touched. The Engineer will then disconnect his headset, giving a visual **"All clear"** signal to the Captain when he is clear of the aircraft.

Powerback

Powerback is the term used to define the procedure whereby reverse thrust is used to back the aircraft off the stand.

Only Captains are permitted to handle the aircraft during powerback.

The stand and adjacent taxiway must be clean and free of debris, ice, slush, snow or standing water.

Both thrust reversers must be serviceable and used; reverse thrust must not exceed 85% (11000) HPrpm.

The fuel used is included in the taxi fuel allowance.

The Captain should brief the ground engineer on the procedures to be used.

Complete the normal engine start checklist. Air conditioning must be switched off during powerback.

The Engineer will use a long-lead headset and maintain voice contact at all times during the powerback. He will monitor the area to the rear of the aircraft and inform the crew of any abnormal situations.

The First Officer will monitor the R/T, power selected and the engine instruments.

Obtain powerback clearance from ATC and inform the Engineer. Release the brakes and move forward 1 metre (to free the brakes). Select reverse idle then, if necessary, increase thrust to the minimum required to move rearwards up to the 85% (11000) HPrpm maximum.

During powerback the speed may be reduced by selecting one or both engines to forward idle.

THE AIRCRAFT BRAKES MUST NOT BE USED WHILE THE AIRCRAFT IS MOVING BACKWARDS. STOPPING THE AIRCRAFT MUST BE ACHIEVED BY THE SELECTION OF FORWARD IDLE THRUST. BOTH PILOTS MUST PLACE THEIR FEET ON THE FLOOR DURING THE POWERBACK.

Maintain sufficient speed to allow the aircraft to move over surface undulations without stopping. Powerbacks should be kept as straight as possible, but nosewheel steering may be used if required. To stop rapidly select forward idle on both engines and if necessary forward thrust.

On completion of the powerback manoeuvre, select air conditioning on.

Record use of the procedure in the Tech Log.

FROM: Captain R W Baldwin
Flight Manager Technical/Training 1-11

TO: All 1-11 Pilots 03 May 1991

FLYING MANUAL AMMENDMENT

Your personal copy of the 1-11 Flying Manual Revision 4 is enclosed. As many of the pages have undergone change, the whole Manual, less cover and dividers, has been re-issued, together with a SUMMARY OF CONTENTS.

This Revision, together with a revised QRH and Single Card Checklist, will become effective on a date specified by FCN.

In the meantime, careful study of significant changes should be made. In particular, you should note that there are several changes/additions to the 'Memory Items' of certain checklists.

The revised QRH and checklist will be placed on all 1-11 aircraft, wrapped in polythene covers, ahead of the effective date. They must not be opened/used until the date specified in the FCN.

Please note that, to keep the number of QRH pages to a reasonable level, all references to -400 aircraft have been removed. The Flying Manual, however, still contains the relevant -400 information.

The 1-11 Technical Manual will be updated in due course.

R Bald

Dick Baldwin

Should an emergency occur during powerback:

The aircraft must be stopped and an assessment made of the situation. In general:

1. Remain in position and deal with the emergency,

then:

2. Return to stand if it is safe to do so.

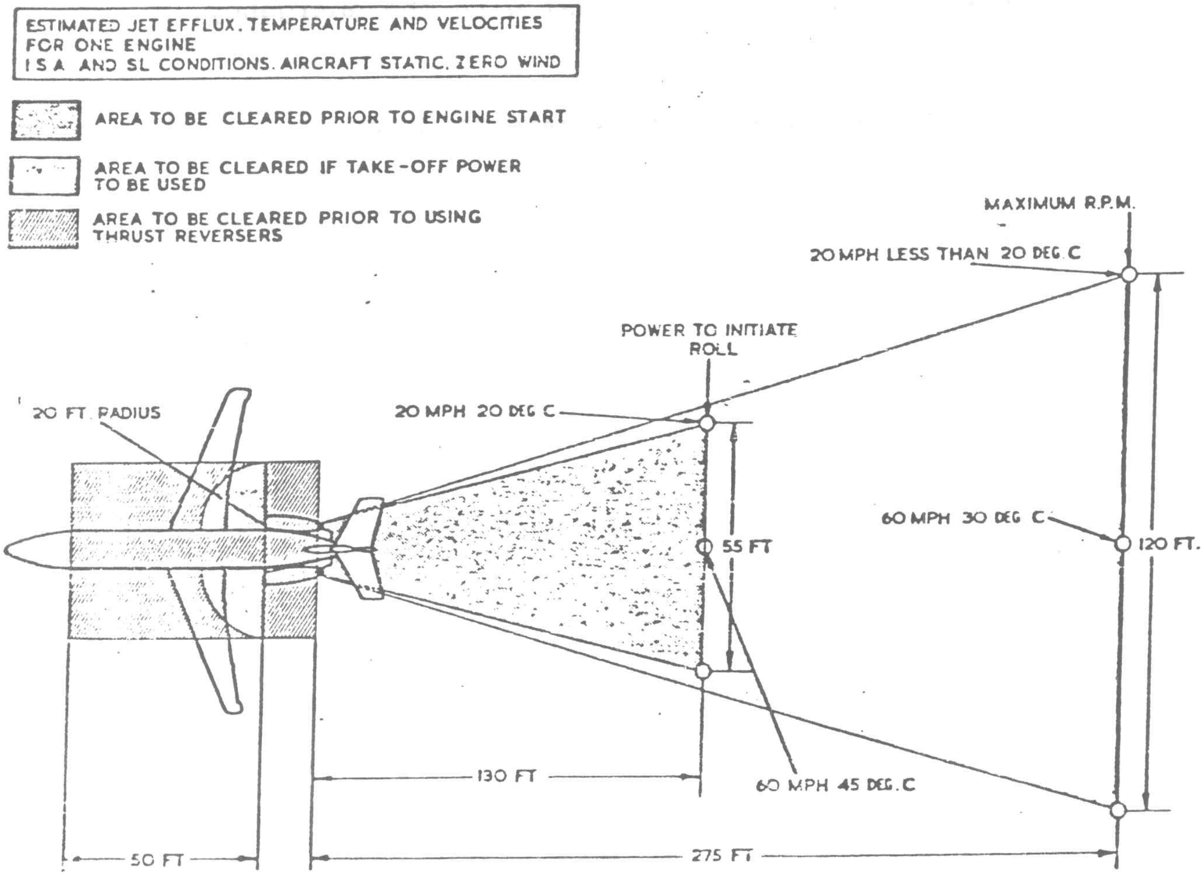

ESTIMATED JET EFFLUX. TEMPERATURE AND VELOCITIES FOR ONE ENGINE I S A AND SL CONDITIONS. AIRCRAFT STATIC. ZERO WIND
AREA TO BE CLEARED PRIOR TO ENGINE START
AREA TO BE CLEARED IF TAKE-OFF POWER TO BE USED
AREA TO BE CLEARED PRIOR TO USING THRUST REVERSERS
MAXIMUM R.P.M.
20 MPH LESS THAN 20 DEG C
POWER TO INITIATE ROLL
20 FT. RADIUS
20 MPH 20 DEG C
60 MPH 30 DEG C
55 FT
120 FT.
130 FT
60 MPH 45 DEG C
50 FT
275 FT

FIG 1 - JET EFFLUX DANGER AREAS

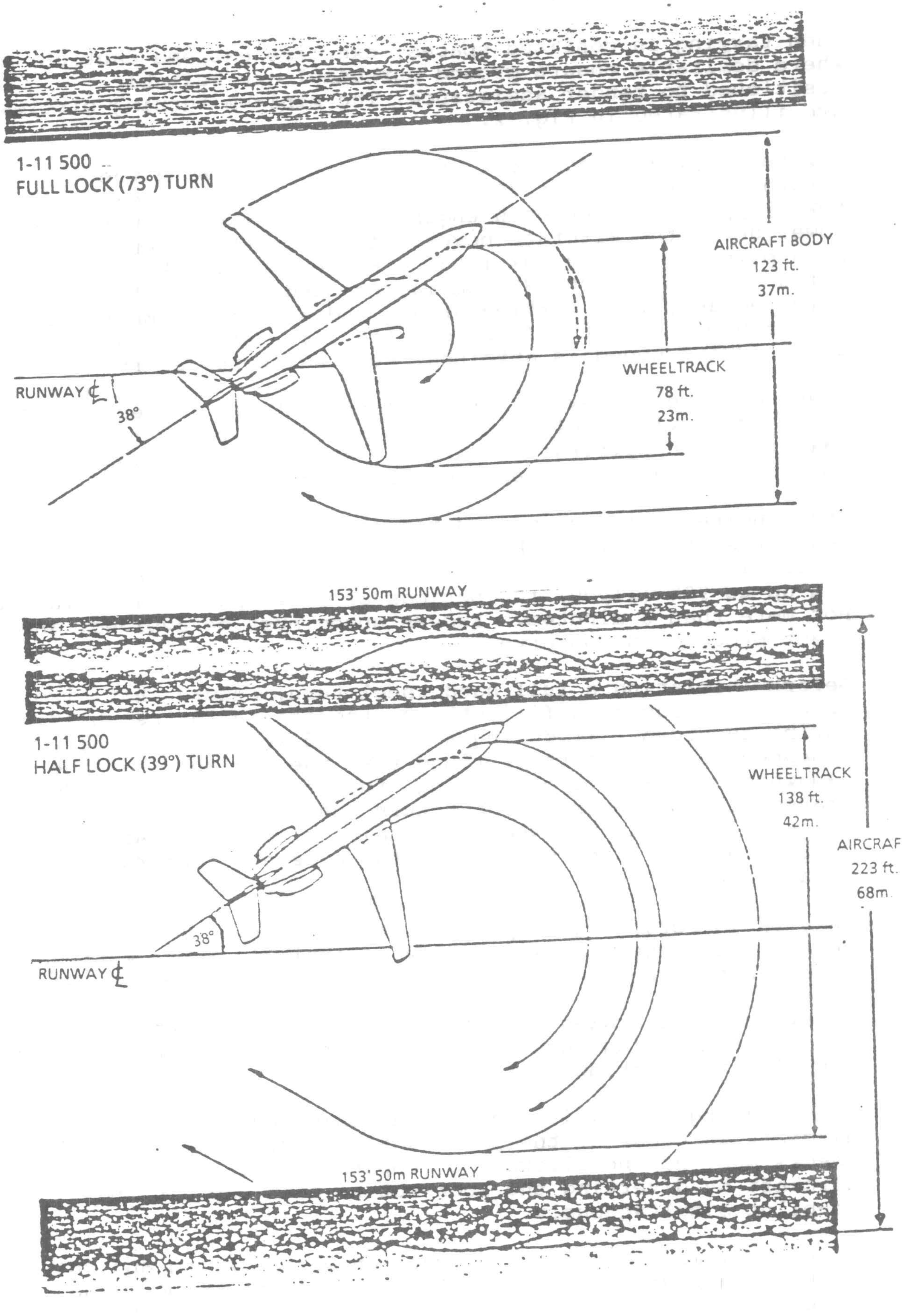


FIG 2 - MINIMUM TURNING CIRCLES

TAXYING

When taxying in confined spaces, exercise extreme caution, and where desirable ensure ground personnel are suitably positioned to render assistance. The minimum turning circles are illustrated in Fig. 2.

Before taxying, check foot brake pressures. With the nosewheel central, set 75% (9500) HP rpm, using steady even power application on both engines. If necessary increase power until the aircraft moves. Avoid bursts of unnecessarily high power; normally 80% (10500) HP rpm should be sufficient, but up to 86% (11000) HP rpm may be used. Ensure the blast is directed away from working areas, and always remember the strength of the jet efflux (see Fig 1.). After breakaway and when taxying speed is attained, set engine rpm as required.

Whenever power in excess of 75% (9500) HP rpm is required to maintain taxying, following unusually high rpm to initiate taxy roll, the aircraft should be returned for a brake inspection and rpm values recorded in the Tech Log.

When engine anticing is required for taxying (see Adverse Weather section, Ice & Rain), and the temperature is below +1° it is important to ensure adequate protection by increasing HP rpm up to 90% (11000) for periods of 5 seconds at intervals of not more than 8 minutes. Excess speed must be avoided, and blast precautions observed.

Before initiating a full hand wheel turn, ensure that aircraft speed has reduced sufficiently to require no further braking during the turn. If during a full hand wheel turn, the nosewheel castors further round than the maximum that the handwheel is capable of setting, then coarse use of rudder and brakes will be necessary to return the nosewheel within the range so that the handwheel is again in control. After completing the turn, centralise the nosewheel before applying final brakes.

Taxy the aircraft at a speed which will permit the cabin crew to carry out their duties safely. Particular care must be taken when cornering, braking or traversing uneven taxiways.

Always use the brakes as little as possible during taxying and, when stopping, ensure the aircraft is stationary before applying the parking brakes.

The 'Taxying' Checklist should be commenced as soon as the aircraft is clear of the parking area, but attention to these Checks must not be allowed to jeopardize the safety of the aircraft by diverting the look-out of both Captain and Co-pilot simultaneously.

Turn-off lamps should be switched on when taxying and only switched off when passing FL100 during the climb. They should be switched on at FL100 during the descent and switched off again when parking at the destination. Fin (logo) lamps (where fitted) should be used at night.

At night, landing and turn-off lights should be used at all times. In low visibility taxy slowly and with extreme caution, particularly when the visibility is less than 200m; when external visual clues are scarce, occasional glances through the side windows should assist in gauging speed which could otherwise increase unnoticed. Use all available means to increase flight deck vision (windscreen wipers, landing and turn-off lights etc), and aim to taxy at a speed that will ensure stop can always be made within the range of forward visibility.

Subject to local restrictions, and in order to avoid congestion in airport passenger terminals when the departure is affected by ATC delays, aircraft may be taxied to Off-stand holding areas and the engines shut down. If this procedure is used complete the After Landing and Shutdown Checklists. Before re-starting complete the Pre-start Checklist. Engineering and fire cover is not required and will not normally be provided.

In adverse weather conditions, at the end of the runway immediately before take-off, the Captain may call for an engineer to carry out a check for ice on those surfaces of the aircraft which are visible from the ground but not from within the aircraft.

TAKE-OFF

Weather Minima

If the weather at the departure airfield is below Cat 1 or appropriate non-precision weather minima, a suitable diversion airfield offering Cat 1 minima or better must be available within 60 minutes flying time at single-engined speeds (approx 250 nm). This requirement does not prevent the Captain electing to carry out a Cat 2 AOM asymmetric approach following an engine failure on take-off or in the climb.

Take-off Thrust Settings

'Full Throttle' thrust - thrust when throttle lever is fully forward, as used after engine failure during take-off, for go-around and for take-off in snow, slush, or standing water when special Performance Manual data is used.

'Standard' take-off thrust - thrust used for take-off when no thrust reduction is being applied.

Extract the standard thrust index from the Performance Manual Tables and set the thrust gauge indices to this figure.

'Reduced' take-off thrust - thrust used when applying any thrust reduction procedure, and should be used whenever runway, airfield and other conditions permit.

Reduced thrust must not be used when:

1. Runway is slippery, or covered with snow, slush or standing water.
2. The performance summary specifies the use of Standard Thrust for the runway.
3. Either or both thrust reversers, lift dump, or any part of the braking system is inoperative.
4. A large surface temperature inversion is present, i.e. 1°C or more per 100ft.
5. Windshear is reported.
6. The airfield altitude exceeds 3000ft.
7. The tailwind component exceeds 10kt.
8. The actual take-off weight is within 2000 kgs. of the maximum performance limited take-off weight for the runway / temperature / flap setting.

Extract the standard thrust index from the Performance Manual Tables, reduce by 30 units and set the thrust gauge indices to the reduced value.

Noise Abatement Power:

75% thrust for reduced thrust take-offs.
70% thrust for standard thrust take-offs.

The Performance Manual may specify lower power setting for particularly noise sensitive airfields.

"Power set"

This term is to be reserved for the call confirming that the appropriate power has been achieved on both engines. The other engine instruments are checked after this call has been made. The minimum acceptable thrust for take-off is 97% (or 100% if reduced thrust is used) indicated on both engines by 60 kt, and although the indicated thrust may increase by about 2% during the take-off run (due to ram effect) the take-off must be abandoned if less than 97% (or 100% if reduced thrust used) is indicated at 60 kt.

The time taken for the aircraft to reach 60 kt, from either a rolling or standing start, normally provides for:

1. Engine acceleration time.
2. Stabilisation of engine indications, including % thrust.
3. Achievement of normal operating temperatures within the engines.
4. Adjustment of power setting to achieve 100%.

If an engine fails to achieve 97% with a standard thrust index setting, take-off must not be attempted with a reduced thrust index in order to achieve 100%.

Check Start

If the Captain has good cause to suspect that a particular engine might be sluggish (first flight of the day, Tech Log history), he may elect to use the 'Engine Check Start' procedure (see 1-1-12), subject to consideration of:

1. Airport noise sensitivity and effects of jet blast.
2. Slippery runway.

Take-Off Flap Setting

Use 18° (NLE 13°) flap in preference to 8° (NLE 6°) for take-off, unless this would preclude the use of reduced take-off thrust.

20° (NLE) flap should be used as required by performance considerations, see Operating Policy 1-4-6.

Normal Take-Off

Establish V_1, V_R, V_2 and V_{FU}; set integral ASI indices to V_2, and outer bugs to V_1 and V_{FU}. Extract and set the take-off thrust index to be used.

A rolling start should be used provided that ATC clearance has been received before or whilst entering the runway and:

1. Runway surface free of snow, slush or standing water.
2. Either: The runway length is in excess of 3,200m, and ambient temperature ISA + 10°C or below,
   Or: Actual weight is lower than max runway permitted take-off weight by 200kg when standard thrust is used or 2,200kg when reduced thrust is used.

Rolling Start - Enter the runway and line up, setting 75% (9000) HP rpm during the turn on, and then open the throttles to Take-off power smoothly and without delay.

Standing Start - Enter the runway, line up, and apply the parking brake. When take-off clearance is received, release the brakes and open the throttles to Take-off power smoothly and without delay.

Engine Check Start - Enter the runway, line up, and apply the parking brake. When take-off clearance is received, open the throttles to Take-off power smoothly and without delay, check 97% (minimum) is indicated on both engines, and release the brakes. The aircraft must not be allowed to move forward with the brakes on. Do not take-off if 97% is not achieved on both engines.

During take-off roll - Check brake pressures zero, and start the stop watches as the aircraft starts to roll. Maintain light forward pressure on the control column until V_R. During the take-off run the indicated thrust may increase by approx 2% - do not reduce the throttle settings to maintain 100%. Check all engine indications are within the normal limits and check that the HP rpm is commensurate with the take-off power indicated by the thrust gauges.

Maintain directional control by rudder fine steering.

Rotation - Initiate rotation at V_R by a firm rearward movement of the control column (to achieve a rotation rate of about 3°

per second), and establish the recommended initial attitude of:-

OLE	10° (18° flap take-off) 12° (8° flap take-off)
NLE	12° (13° flap take-off) 14° (6° flap take-off)

to achieve V_{FU} by 500ft. Do not exceed V_2+30kt below 100 ft. Retract the gear when a positive climb indication is observed on the altimeter and VSI.

Take-off through Water, Slush or Snow

Whenever these conditions are present, refer to the limits given in Adverse Weather section, Ice and Rain.

Low Visibility

With the aircraft aligned on the runway, Captains are required to confirm that the actual visibility at the threshold corresponds with the reported RVR. (In 125m RVR it should be possible to see 6 centreline lights at 15m spacing or 3 at 30m spacing.) Captains should consider runway state and braking action before taking-off in reduced visibility conditions, and take care to rotate at the normal rate when taking-off in such conditions.

Crosswind Take-off

The technique is the same as for a normal take-off. Unstick must be positive to prevent touching down with drift. To keep the wings level a little up-aileron should be applied on the into-wind wing but not enough to extend the spoilers.

INITIAL CLIMB

Monitor flight instruments, avoiding concentration on any one instrument. During the brief period below 500ft only an emergency requiring immediate attention should be allowed to interrupt the close monitoring of the flight instruments.

Hold the initial attitude until V_{FU} is achieved, aiming to achieve this speed at 500ft.

At 500 ft:

1. Check V_{FU} is achieved.
2. Select 0^{o} flap.
3. Set Noise Abatement Power.

If at 500ft the speed is below V_{FU} (18^{o} flap (NLE 20^{o} or 13^{o} flap) take-off):

1. Check speed is within 10kt of V_{FU}.
2. Select 8^{o} flap (NLE 6^{o} flap).
3. Check V_{FU} is achieved.
4. Select 0^{o} flap.
5. Set Noise Abatement Power.

An increase in attitude to about 15^{o} is usually required to maintain V_{FU}. Do not exceed 20^{o} nose up. If the speed decays below V_{FU} after flap retraction, restrict bank angle to 15^{o} until V_{FU} is restored.

At 1500ft select airconditioning from engine air and select airframe anticing if required. Adjust throttles to maintain Noise Abatement Power.

At 4000ft (or as published in the Performance Manual), re-check the flaps are 'zero', set climb power and start accelerating maintaining about 1000 fpm ROC. An attitude of 6^{o}-8^{o} nose up is required.

At some noise-sensitive airfields the noise abatement climb will continue to a height above 4,000ft. This height is annotated for the particular runway in the Airfield Performance Summary, Performance Manual. In these cases delay the start of the Climb Checks accordingly.

Do not exceed 240kts until both pilots have checked the flaps are at zero and then accelerate to the appropriate en-route climb speed.

After setting Climb Power, the autopilot should be engaged as soon as convenient.

The noise abatement technique may be disregarded in conditions of turbulence, icing etc. Flap retractions and power reduction can be delayed, until speed and altitude are adequate.

The APU will normally be shut down on all sectors at the appropriate point in the Climb Checks, and restarted during approach if required.

EN-ROUTE CLIMB

Standard Procedure

Climb at 280kt until the anticipated cruise Mach No is reached, then climb at this speed. Thereafter only reduce speed (to not less than the ERC speed) to maintain 500fpm rate of climb. Climbing at lower speeds causes a fuel and time penalty.

Maximum Rate of Climb

Climb at 250kt/0.64M to the required cruise level. This technique is only effective for short periods or at low levels. At high AUW and at high levels it is essential to maintain high speed in order to preserve climb performance.

Maximum Gradient Climb

Climb at the En-Route Climb speed (ERC).

Operational Necessity Climb Power

This may be used for short periods only:

1. To meet ATC requirements.
2. To achieve a higher than normal cruise level, in order to increase clearance over terrain or adverse weather.

Where possible, it is preferable to reduce speed to meet the above requirement, rather than to use Operational Necessity Climb power. In extreme conditions it may be necessary to use Operational Necessity Climb power and maximum rate of climb speed, or a higher speed as dictated by turbulent conditions. Under these circumstances FL350 will normally be reached within the 300fpm ceiling.

FUEL MANAGEMENT

B1-11 500 a/c

Maintain both booster pumps on in each wing tank. Fuel transfer from the centre tank will commence as soon as the forward booster pumps are switched on immediately prior to take off, and can only be stopped by switching those pumps off again at a safe height.

S1-11 & B1-11 400 series a/c

Maintain both booster pumps on in each wing tank. When fuel has to be transferred from the centre-section tank, switch on both transfer pumps before selecting transfer cock switches to open.

Fuel transfer is completed when the transfer LP lamp remains on. Close transfer cocks and switch transfer pumps off.

CRUISE

Normal Cruise

Normal Climb Power may be maintained for up to five minutes during level acceleration to the required cruise speed. The normal cruise speeds are shown on SWORD and in the Performance Manual. Set an appropriate thrust to maintain cruise speed and adjust for changes in weight and flight level. In turbulence reduce to and maintain the appropriate rough air speed.

Maximum Range Cruise

Maintain 99% Best Range speed - See Performance Manual.

Head/Tailwinds

Wind effect may be countered by changing cruise FL, if the advantage is better than 10kts/2000ft. Speed adjustment depending on wind component is described in Performance Manual Cruise Speed Chart, an increase for headwind, and a decrease for tailwind.

Fuel Checking

A fuel check must be carried out at least every hour, and an estimation made of the fuel available at destination. The fuel check consists of:

1. Ensuring that the fuel indicated on the gauges minus 'fuel required to destination' equates to the planned remainder.

2. A/C with totalisers - Ensuring that the fuel on board (gauges) plus the fuel consumed (totalisers) equals the initial tanks fuel. (Allowance may be made for fuel used by the APU.)

If this check is unsatisfactory carry out a full fuel check using the Performance Manual Data.

In adverse conditions it is expected that CONTINGENCY FUEL may be partly, or entirely, used en-route. If a fuel check indicates that the aircraft will arrive at destination with less than RESERVE FUEL + DIVERSION FUEL in the tanks, action must be taken to either reduce fuel consumption for the remainder of the cruise (higher altitude, different speed, shorter route), choose a closer alternate with Cat 1 or better weather, or make a 'Tech Stop'.

DESCENT

Standard Procedure

Reduce power to between 72% (9300) and 80% (10000) HP rpm, and descend at 300kt. If the aircraft has been flying at a cruise Mach number, maintain that Mach number during the descent until 300kt is achieved, then continue at 300kt. With the aircraft clean, a descent rate of about 2,500fpm will be achieved. To increase the descent rate reduce power to Idle (if clear of icing), use a higher IAS or extend speedbrakes in that preference order. Where possible, the descent path should be planned to enable the Cruise Mach/300 kt technique to be used. If the speed is increased to achieve a higher descent rate, then a maximum of V_{MO}/M_{MO} is permissible in smooth conditions.

The APU will be started at the appropriate point in the Approach Checks if required by WAT considerations. (see checklist).

Steep Descents

Above FL150 - With Idle power, speedbrakes 20° and 0.77M/300kt, the rate of descent will be about 5,500fpm, at 250kt the rate of descent will be about 3,000fpm.

Below FL150 - The steepest descent gradient will be achieved with Idle power, speedbrakes 50°, and at 300kt. At speeds below 300kt the steepest gradient is achieved at 240kt, approximately 4,000fpm; speed increase from 240kt to 290kt decreases the descent gradient, because of speedbrake blow-back. With Idle power, speedbrakes 50°, and 200kt, the rate of descent will be approximately 2,500fpm.

Approaching Safety Height + 3,000ft.

Reduce the rate of descent to 3,000fpm maximum.

Intermediate Approach

Speed must be reduced to 240kt when approaching the main entry beacon or when the aircraft is within 20nm of touchdown. A progressive speed reduction should then be made, initially flying at 210kt, aircraft clean, until selecting flaps 8° or 18° (NLE 13° or 20°) and then reducing to the intermediate approach speed of 170kt; this speed should be achieved when the aircraft is on an extended 3° glidepath at a range of ten miles from touchdown.

Holding

Below FL200 - Maintain the clean configuration at 210kt.

FL200 and above - Maintain the clean configuration at 240kt.

INTENTIONALLY LEFT BLANK

APPROACH

The speeds quoted in this section are those to be flown in normal conditions. Should moderate or severe turbulence be encountered, the approach speed may be increased by 5kt, but the aim is still to achieve V_{AT}+10kt at the threshold.

General

If an approach is to be made to a runway equipped with a serviceable ILS in weather conditions requiring a Monitored Approach, an automatic approach must be carried out if the aircraft systems are operating satisfactorily; if the autopilot is not fully serviceable, complete a manual FD approach or manual instrument approach on basic instruments as appropriate, observing the relevant weather minima.

A go-around must be carried out immediately the decision height is reached unless the required visual reference has been obtained.

The autopilot may remain engaged to the appropriate disconnect height.

Autopilot disengagement must always be confirmed by checking that the A/P MI shows 'OFF' or (for aircraft without an A/P MI) the autopilot engage switch is at 'Off'. If it appears that the A/P may not have disengaged on selection, select the A/P master switch to 'Off' (or 'Kill') immediately.

Go-around immediately if a discrepancy arises between the ILS/VOR centre line displays on the two course indicators, unless this discrepancy can be resolved by other means e.g. visual reference or radar.

ASI Indices

Using data from the reference speed booklet for the estimated landing weight, set the inner ASI index to V_{AT}+10 and the outer indices to V_{AT} and V_{FU}.

Radio Decision Heights

Radio Decision Heights will always be used for Cat 2 or 3A approaches. Radio Decision Heights, when promulgated, will be used for Cat 1 auto approaches. If an auto approach cannot be flown, or an auto approach becomes a manual approach, the Servo Decision Height must be used.

Autothrottle (not 400 & 539)

Speed and autothrottle performance must be closely monitored whenever autothrottle is engaged.

When autothrottle is engaged and either the autopilot is engaged, but not coupled to a height lock or glideslope, or the aircraft is being hand flown, a disturbance may cause a divergence from the flight path without the resultant speed change which would tend, if the throttles were fixed, to restore the trimmed condition. The rate of descent and attitude must therefore be closely monitored when flying with autothrottle engaged without adequate flight path reference or control, to avoid the rapid build up of high rates of descent. In addition any change in dialled speed must be followed by adjustment of pitch attitude.

For a Cat 3a approach, or an approach terminating in an autoland, autothrottle must be tested prior to the approach (in the holding pattern or on reaching the intermediate approach speed of 170kt). It must be used on final approach and engaged, at the latest, once flaps have been lowered to 45° and the speed stabilised at V_{AT}+10kt.

After engaging autothrottle sufficient time must be allowed to confirm that the system is maintaining the speed stable at V_{AT}+10 before selecting prime land.

For manual landings the autothrottle will be disengaged for the flare.

When autolanding, disengage the autopilot and autothrottle simultaneously on touchdown.

If achieved IAS deviates substantially from the selected speed, and an automatic disconnect does not occur, disengage the autothrottle.

If the autothrottle disengages, the power should be set immediately to 88% (11000) HP rpm before adjusting the power further for speed corrections.

ILS APPROACH

Maintain 210kt, aircraft clean, and then reduce to 170kt with flap $8^o/18^o$ (NLE $13^o/20^o$) by 10 miles from touchdown and, with gear up, establish on the localiser.

Intercepting the GP

S1-11 When approaching the GP select/check flaps 18^o and select gear down reducing to 160kt; descending through 2000ft select 26^o flap and reduce to V_{AT}+20kt. At 1500ft select 45^o flap and reduce to V_{AT}+10kt and maintain to the threshold.

B1-11 In Cat 2/3 conditions: When approaching the GP select/check flaps 18^o (NLE 20^o) and select gear down reducing to 160kt; at 2 dots GP deviation select 26^o flap and reduce to V_{AT}+20kt. When passing 2000ft QFE on the GP, select 45^o flap and reduce to V_{AT}+10kt and maintain to the threshold.

In Cat 1 conditions: When approaching the GP select/check flaps 18^o (NLE 20^o) and select gear down reducing to 160kt; descending through 2000ft select 26^o flap and reduce to V_{AT}+20kt. At 1500ft select 45^o flap and reduce to V_{AT}+10kt and maintain to the threshold.

Cat 1

At 1200ft QFE select Glide Gearing (or Prime Land if autolanding using Cat 1 minima) or for 400/539 a/c select the Cat 1/Cat 2 switch to Cat 1. This selection must not be made until the speed is stabilised and not below 800ft QFE.

Cat 2 and Cat 3a

NOTE - References to Cat 3a and autoland do not apply to 400 and 539 a/c.

The aircraft must be placarded **"Cat 2 Approach"** or **"Cat 3a Autoland"** as appropriate. When making an approach to Cat 2 minima the runway and ILS installation must be approved for Cat 2 operation and when making an approach to Cat 3a minima the runway and ILS installation must be approved for Cat 3a operation.

At 1200ft QFE select Prime Land or, (400/539 a/c) select the Cat1/Cat2 switch to Cat 2.

If the speed is not stabilised the selection should be made not later than 800ft QFE.

The radio altimeter should be used for height reference below 400ft.

For an approach to Cat 2 minima the autopilot must remain engaged to Cat 2 DH and thereafter it should remain engaged to minimum disconnect height. In addition, an autoland must be planned on 'L' category runways subject to autopilot status and surface wind conditions (ie if the surface wind permits a Cat 2 manual landing but not an autoland, the autoland requirement is waived).

For an approach to Cat 3a minima an autoland must be planned.

In the event of autopilot disconnect, or an FCS malfunction (except autothrottle disconnect or autotrim warning lamp illumination - see below), revert to the appropriate Cat 1 AOM and use the servo altimeter decision height.

If the autothrottle disconnects during a Cat 3a approach, reversion to a Cat 2 manual landing is permitted, provided there is time to rebug the radio altimeter to the Cat 2 decision height. If in doubt go-around and reposition for a Cat 2 approach.

If the autopilot disconnects after decision height, the approach may be continued provided that adequate visual reference is maintained.

Below 200ft R, when making an approach in Cat 2 or Cat 3a conditions, go-around if (B1-11) the ILS Monitor light flashes, or (S1-11) the AZM or GP mode indicators flash.

Below 100ft R, if the autotrim warning light is illuminated, disconnect the autopilot; a go-around is required in CAT 3 conditions but not in CAT 2 conditions provided the required visual reference has been obtained.

Cat 2/3a protection must be obtained when operating in Cat 2/3a weather conditions. In good weather this protection should be requested but, if not available, practice approaches may be made. However, if the ILS critical areas are violated by vehicles or other aircraft when the landing aircraft is below 300ft on final approach, the localiser performance could be temporarily downgraded with consequent excessive bank demands and risk of auto disconnect.

If there is a Tech Log request from Engineering for a Standard Landing, an Autoland may be carried out in Cat 1 conditions even if the aircraft is placarded APPROACH.

An autoland attempt may be made on a runway with a Performance Manual 'E' category, but failure should not be recorded in the Tech Log.

NON-PRECISION APPROACHES

Localiser only, VOR, NDB.

Inhibit the GPWS GP before reaching 500ft R if an ILS frequency is selected during a non-precision approach. The approach must be made by reference to at least two radio receivers.

Maintain 210kt, aircraft clean, and then reduce to 170kt with flap 8°/18° (NLE 13°/20°) by 10 miles from touchdown. When on intercept or final heading select/check flaps 18° (NLE 20°), select gear down and reduce to 160kt.

When established on final approach, level or descending, and before reaching the beacon/marker/final approach point:-

1. Select flaps 26°.
2. Reduce to V_{AT}+20kt.

The autopilot must be disconnected for descent below 1000ft QFE. or when flap 45° is selected.

At the Beacon/Marker/Final Approach Point:-

3. Start stopwatch.
4. Select flaps 45°.
5. Set pre-calculated rate-of descent, using VSI.
6. Reduce speed to V_{AT}+10kt and maintain to the threshold.
7. Check the achieved rate of descent on altimeter against stopwatch, and if necessary correct it.

At 1000ft QFE if on VOR approach:-

8. Place (B1-11) heading marker, (S1-11) steering index under the lubber line.

9a. B1-11 Select mode selector to HDG (VOR approach).

9b. S1-11 Select coupling switch to 'Steer'.

10. Move (B1-11) heading marker, (S1-11) steering index as required.

NOTE -The Handling Pilot must continuously monitor the beacon identification signal throughout an NDB approach.

539 Series A/C - When carrying out NDB letdowns, do not descend below the Sector Safe Altitude unless the validity of the ADF bearing can be checked by some other means (eg VOR or DME). This particularly applies to the overhead indication.

RADAR APPROACH

The Captain is responsible for maintaining safe terrain clearance during radar-controlled Initial and Final Approaches. Requests for position checks should be made to the Radar Controller at regular intervals, and full use made of the other navigational aids available for continuous cross-checking. Charts are available for Radar Vectoring areas for some airfields.

PAR and SRA approach

Maintain 210kt, aircraft clean, and then reduce to 170kt with flaps $8^\circ/18^\circ$ (NLE $13^\circ/20^\circ$) by 10 miles from touchdown. When on intercept or final heading select/check flaps 18° (NLE 20°), select gear down and reduce to 160kt.

When instructed by the Controller to commence descent on a 3° glide path, disconnect the autopilot and descend at 160kt. On passing 2000ft QFE:-

1. Select flaps 26°.
2. Reduce to V_{AT}+20kt.

When descending through 1500ft QFE:-

3. Select flaps 45°.
4. Reduce to V_{AT}+10kt and maintain to the threshold.
5. Start stopwatch.

During final descent:-

6. Adjust the rate of descent to comply with advice from the Radar Controller.
7. Check achieved rate of descent on altimeter against stopwatch.

On those radar approaches based on a QNH altimeter setting procedure, the Co-pilot must fly the approach and the Starboard altimeter must remain on QNH until the Captain takes over control.

CLOUD BREAK

When an instrument approach is to be followed by a visual circuit, select/check flaps 18° (NLE 20°), lower the gear, maintain 18° (NLE 20°) flap, and fly the visual circuit at 160kt until established on base leg or turning finals. If necessary inhibit the GPWS GP before reaching 500ft R.

VISUAL APPROACHES (MANUAL)

Fly downwind at 170kt, flaps 18° (NLE 20°). When abeam touchdown, start the stopwatch and lower the gear reducing to 160kt. After 50 seconds (still air) turn on to base leg, select flaps 26° and reduce to V_{AT}+20kt.

When correctly positioned turning finals, select flaps 45°. Adjust speed to V_{AT}+10kt and maintain to the threshold. The aircraft should be fully established in the landing configuration by 800ft (minimum 600ft). In the absence of VASI or any other glide slope guidance, the correct approach path is 3°, normally 650-700 fpm rate of descent, with an approach aiming point 300 metres from the runway threshold.

If the speed decays, or the aircraft deviates below the correct approach path, large power increments may be necessary to regain the correct speed and/or the approach path.

ALTERNATIVE APPROACHES

Fuel Economy Approach

When it is expected that visual conditions will exist on the approach from at least 1000ft AAL, then gear and flap selection may be delayed in the interest of fuel economy. As a guide, gear selection may be delayed until 1500ft QFE, and the final flap setting made so that the aircraft is fully established in the landing configuration by no later than 800ft QFE.

Speed and attitude control is especially important with late configuration changes, and care must be taken to ensure that the normal speed/configuration relationship is maintained.

On selection of 45° flap, approximately 87% (10800) HP rpm and an attitude of 0° will be required for a stable approach path to be maintained.

26° Flap Approaches

Two engine approaches and landing with 26° flap are approved. 26° flap should be selected in the normal manner, and the speed then reduced to 26° flap V_{AT}+10kt and maintained to the threshold.

Two engine 26° flap landings may only be carried out in Cat 1 conditions or better provided that the landing distance available is 2500m or more and:-

1. There is no tailwind component.
2. Runway conditions are not adverse.
3. There are no allowable deficiencies affecting landing performance e.g. inoperative lift dump, spoiler, reverse thrust or wheelbrake.

APPROACHING DECISION HEIGHT

Assess steadiness of the approach and aircraft positioning by visual reference or from the displays; if unsatisfactory, disconnect the autopilot, if engaged, fly the aircraft manually, and either continue the approach by visual reference or continue the instrument approach down to the Cat 1 decision height using the flight director, or go-around immediately.

If an auto-approach is satisfactory, and visual reference for a continued approach has been established by decision height, the autopilot may remain engaged down to the minimum autopilot disengage height.

For auto-approaches in bad visibility which require manual take-over because of poor localiser holding, the subsequent judgement of height and control in the pitch axis requires particular care during the later stages of the approach. Therefore, use all aids available, e.g. Flight Director Indicator, VASI's/PAPI's and approach lighting. Be particularly careful to note pitch attitude before disengagement and do not allow the nose to drop inadvertently after Autopilot disengagement.

GO-AROUND

Disengage the autopilot and autothrottle, apply full power, select flaps to 18° (NLE 20°) and simultaneously rotate the aircraft smoothly to a pitch attitude of 10° nose up. Do not allow the speed to fall below 45° flap V_{AT}+10kt / 26° flap V_{AT}.

Acceleration may be slow at first, but smooth and unhurried rotation is essential if initial loss of speed, due to coarse rotation is to be avoided.

Pitch attitude should be maintained at approximately 10° nose up to achieve positive climb and moderate acceleration. If however, there has been a power loss at this stage, the speed should be maintained at its current value, not less than 45° flap V_{AT}+10kt/ 26° flap V_{AT}.

When a positive climb is achieved select gear up, maintain the correct attitude, monitoring airspeed and cross-checking with all other flight instruments.

On attaining V_{FU}, select flaps up, and reduce power to normal climb power (or to a power commensurate with the required rate of climb and target altitude), allowing the speed to increase to 210kt.

Thereafter:-

1. Maintain 210kt if holding,

or 2. Increase to the normal climb speed if diverting,

or 3. If returning immediately for another approach, on attaining the cleared altitude or flight level, the flaps may be lowered to 8°/18° (NLE 13°/20°), the power adjusted to achieve 170kt.

LANDING

A correct landing and roll out is ensured by adherence to standard procedures, which provide adequate safety margins.

The ideal approach and landing is one which is made at the correct speed (V_{AT}+10kt) and follows an established approach path to cross the landing threshold at approximately 30ft (wheel height) achieving touchdown some 300 metres from the threshold. Failure to follow prescribed procedures will erode safety margins.

The aircraft must not be landed with a high rate of descent. At 100ft check the power setting, airspeed, and rate of descent. If the rate of descent is above 1000 fpm, the approach should be discontinued by taking go-around action.

The maximum two engine threshold speed is V_{AT}+15kt. If the threshold speed exceeds V_{AT}+15kt, a go-around must be carried out, as at higher speeds there is risk of premature nosewheel contact with the runway.

When the approach is continued, on crossing the threshold progressively close the throttles and commence the flare; only a small attitude change is required. Do not prolong the hold off; place the aircraft main wheels on the runway with the nosewheel just off the ground, then extend the lift dumpers and select reverse idle.

Lower the nosewheel gently on to the runway. If reverse thrust is to be used, select normal reverse without delay. In an emergency, emergency reverse thrust may be used, and may be selected immediately on touchdown, though care must be taken to avoid heavy nosewheel impact with the runway.

Reverse Thrust

Normal reverse thrust should be used when:-

1. The landing distance is less than 2,000m;

or 2. The landing distance is less than 2,500m and a tailwind exists;

or 3. Adverse runway conditions exist,

and reverse idle may be selected when a safe stop is assured. Otherwise use reverse idle thrust.

Landing with 26° Flap

The aircraft will assume a slightly more nose up attitude than with 45° flap. There is comparatively little drag and, in order to avoid excessive float, the throttles should be closed well before the flare.

Crosswind Landing

Normal approach and landing procedures should be used ensuring the aircraft is lined up with the extended centreline of the runway. Just before touchdown, remove drift smoothly with rudder, preventing the upwind wing from lifting by use of aileron.

After landing maintain a small amount of aileron into wind to keep the wings level. In certain conditions reverse thrust may aggravate any tendency to drift if the aircraft "weathercocks". To overcome serious drift it is advisable to revert to forward thrust until the drift has been corrected.

Tailwind Landing

The maximum permissible tailwind for the associated landing weight for each runway is listed in the Performance Manual. A landing must not be carried out in tailwind components above the maximum.

Landing in Turbulent Conditions

It is recognised that in turbulent conditions IAS may fluctuate about the intended approach speed. V_{AT}+10kt should not be considered as the minimum speed, but should be bracketed as accurately as possible. Should moderate or severe turbulence be encountered the approach speed may be increased by 5kt, but the aim is still to achieve V_{AT}+10kt at the threshold.

V_{AT} Landing

Should conditions require the use of a V_{AT} landing (see Adverse Weather 1-2-17), the following technique is recommended:-

> At about 300ft, reduce power by 2% (200) HPrpm and allow the speed to reduce towards V_{AT}. Should V_{AT} be reached before throttle closure, an increase of approximately 3% (300) HPrpm will be necessary to maintain V_{AT}. Because of the lower airspeed a noticeably larger amount of elevator input will required during the flare.

V_{AT} landings should not be practiced during normal line flying. They should only be carried out when conditions demand.

Autolanding

Below 100ft Radio, monitor the approach path of the aircraft by visual reference, being immediately prepared to disconnect the autopilot and autothrottle if necessary and either go-around or carry out a manual landing.

If the autotrim lamp remains on or comes on below 100ft Radio, the autopilot must be disconnected and either go-around or carry out a manual landing.

If any significant drift is apparent during the autoflare, take manual control at the point at which drift should be eliminated.

At touchdown disconnect the autopilot and autothrottle and follow normal landing procedures during the landing run.

Landing in Low Visibility

In low visibility, the landing lamps can produce excessive glare and reduce contrast, thereby reducing the range at which the approach and runway lighting may be seen; in these conditions, extend the landing lamps early, but they should not be switched on until good visual contact has been obtained.

Landing Bounce and Recovery

Landing bounce is associated with increasing lift at touchdown and therefore vigorous rearward movement of the control column during the last part of the flare must be avoided. To recover from a bounce put or maintain the control column in the normal flare position and allow the aircraft to settle back on the runway, using additional power to reduce the rate of descent if required. Do not push the stick forward beyond the normal flare position at any time during the bounce.

Unless the touchdown speed was considerably in excess of the normal speed and/or runway length is critical, or other adverse circumstances exist, a go-around should not normally be carried out.

Landing Run/Roll Out

Maintain directional control initially by rudder/rudder fine steering, assisted as necessary by differential braking, and then by nosewheel steering when at taxying speed. Grade brake pressure to suit runway surface conditions and the distance available once the aircraft is firmly established on the ground.

In the case of wet runways there is risk of aquaplaning at speeds considerably below the 1-11 minimum aquaplaning initiation speed of 110kt. Under such conditions braking should be delayed until after the wheels have spun up. Normal Reverse must be selected without delay. With adverse conditions it may be necessary to use and maintain Emergency Reverse thrust to below 60kt.

When landing on a runway where the required landing distance is only marginally available, maximum braking must be applied until a safe stop is assured.

The applied brake pressure should normally be checked before cancelling reverse thrust. If it is clear that a safe stop is ensured, select Reverse Idle by 60kt followed by Forward Idle. Before selecting Forward Idle, check that the engine HP rpm have decreased to idle.

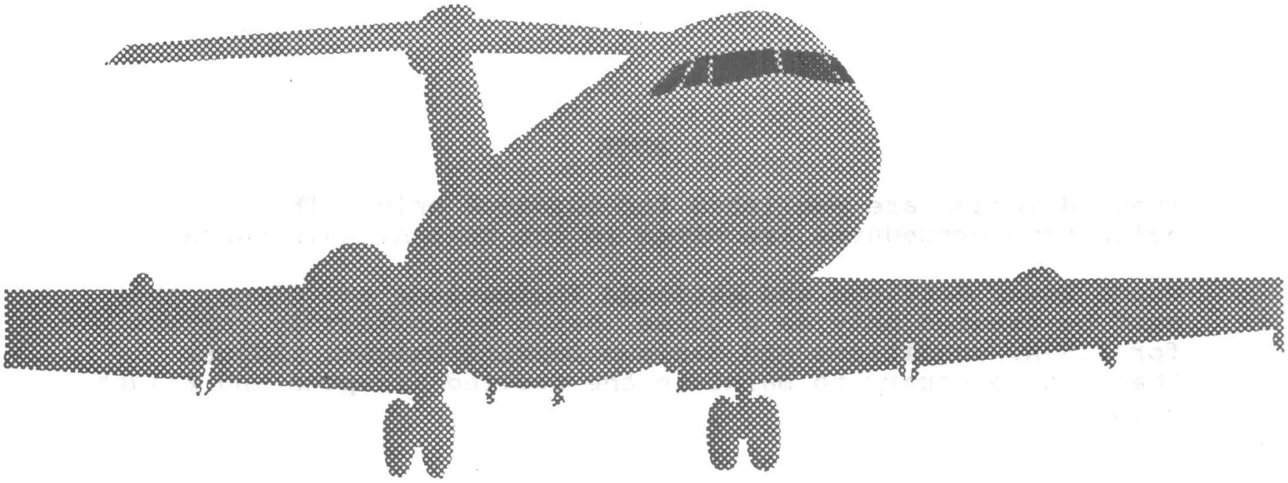
A particular fault can cause total loss of braking below a speed of about 30kt if the anti-skid master switch is On. Therefore the anti-skid system must be switched off at the end of the landing roll.

If it appears that the aircraft may not stop before the end of the runway, use emergency reverse thrust.

Taxying after Landing

Single engine taxy is permitted provided:-

1. The APU (with serviceable generator) is running
2. Only reverse idle was used on landing or 2 minutes have elapsed since the use of normal reverse.



Super One-Eleven

Recommended Procedures

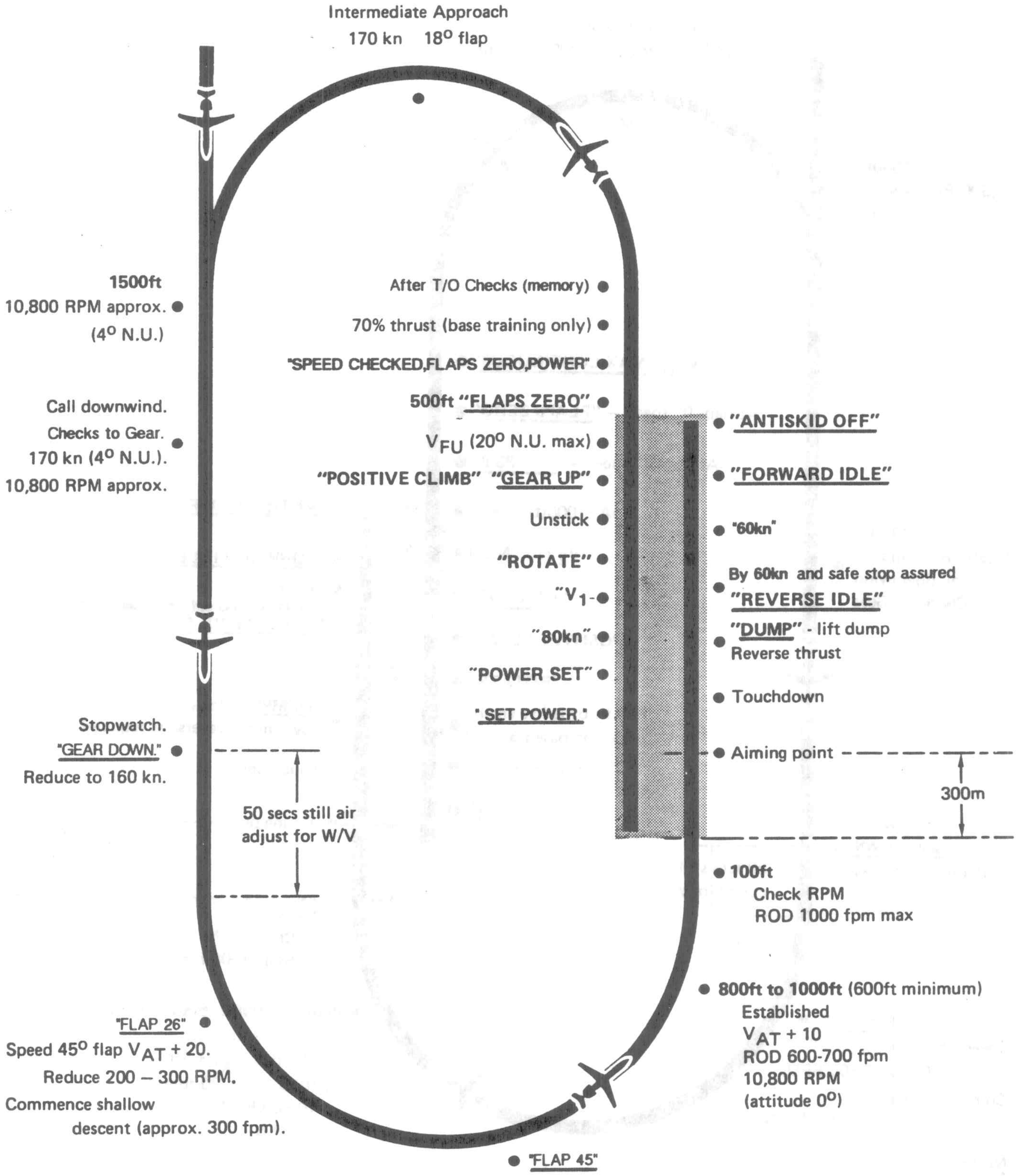
REVISED JANUARY 1989

BRITISH AIRWAYS

NOTE

These diagrams are published for guidance only. The definitive procedures are given in the text of this manual.

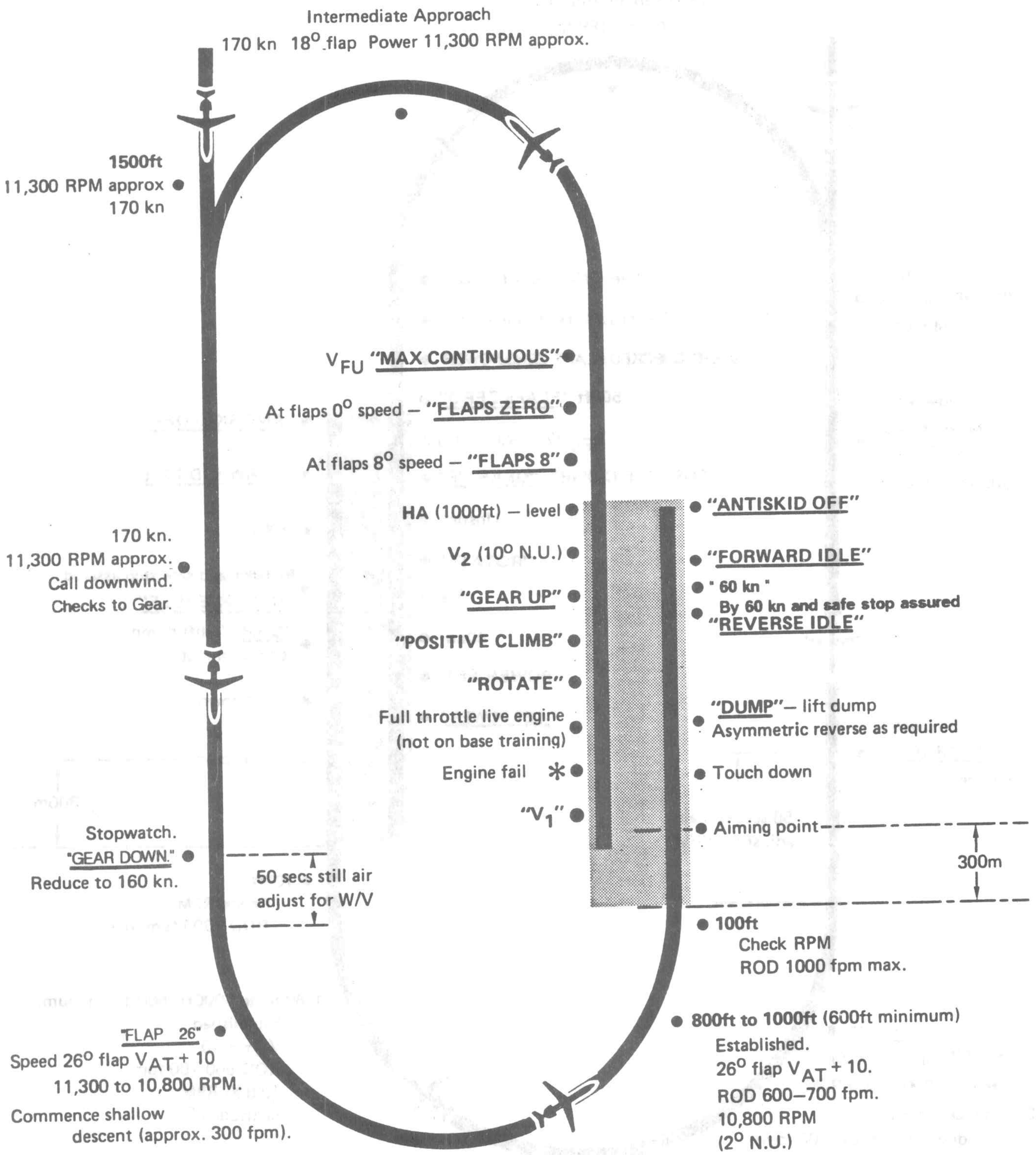
Where Power Settings and Attitude Indications are given, they must be treated only as a guide, being approximately correct for I.S.A. conditions and Maximum Landing Weight. Adjust these as necessary to maintain the desired Airspeed and Flight Path.



NOTE

1. Guide to approx attitude abbreviated e.g. 4° nose up - (4° N.U.).
2. 11,500 RPM used during climb for circuit training.
3. 26° flap approach - 2° N.U., 10,300 RPM on final approach.
4. $\left.\begin{array}{l}26^\circ \text{ flap } V_{AT} \\ 45^\circ \text{ flap } V_{AT} + 10\end{array}\right\} = 18^\circ \text{ flap } V_2 \text{ approx.}$
5. Handling Pilot calls are underlined.

STANDARD CIRCUIT - 8° OR 18° FLAP TAKE-OFF

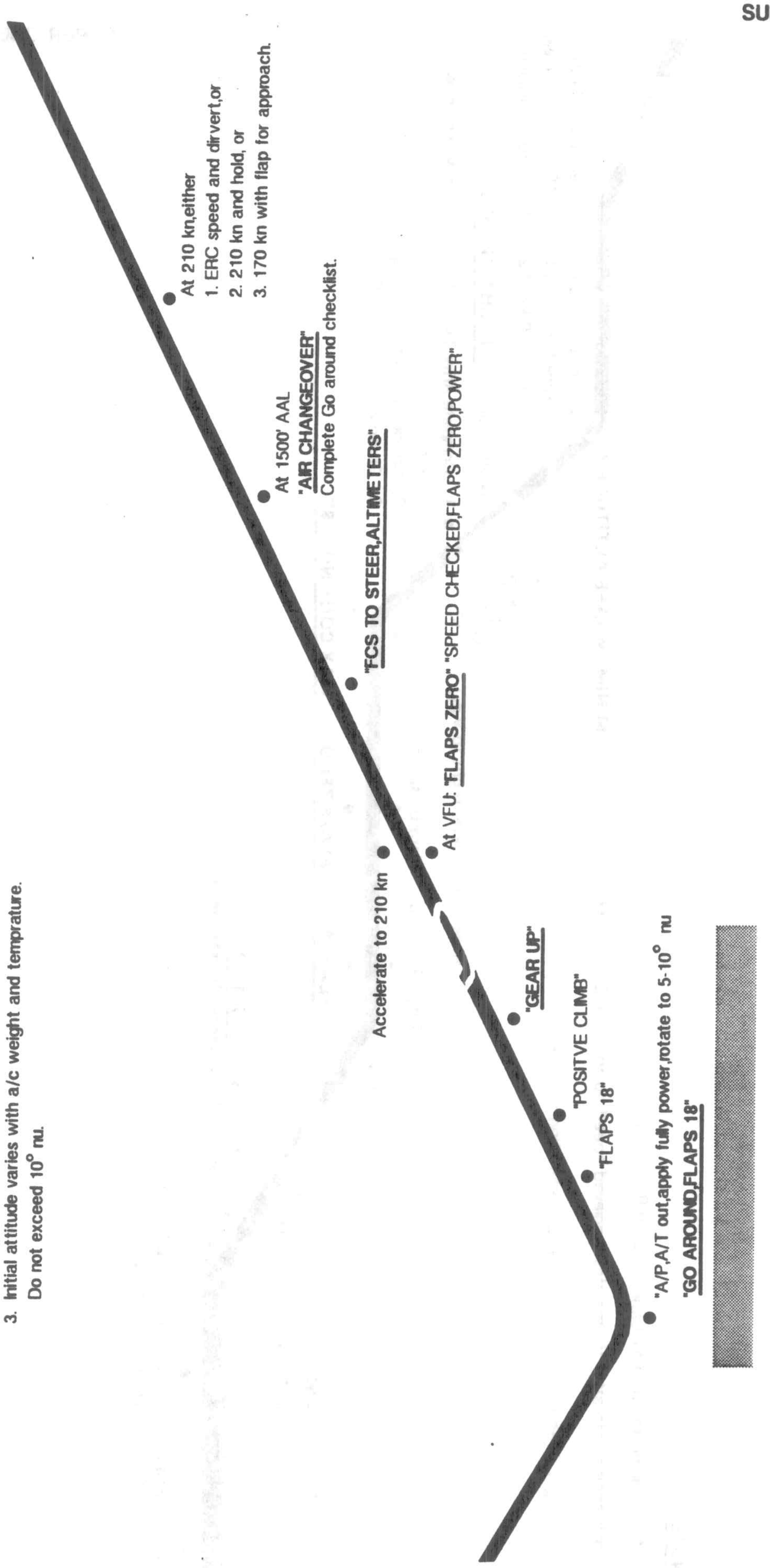


NOTE

1. * If engine fails after V_2 maintain achieved speed up to maximum of V_2 + 20 kn.
2. Keep ball in middle at all times.
3. 26° flap V_{AT} used.
4. 26° flap V_{AT} = 18° flap V_2 approx.
5. 15° bank angle up to Circuit Height.
6. Handling pilot calls are underlined.

SINGLE ENGINE CIRCUIT

SUPER ONE-ELEVEI

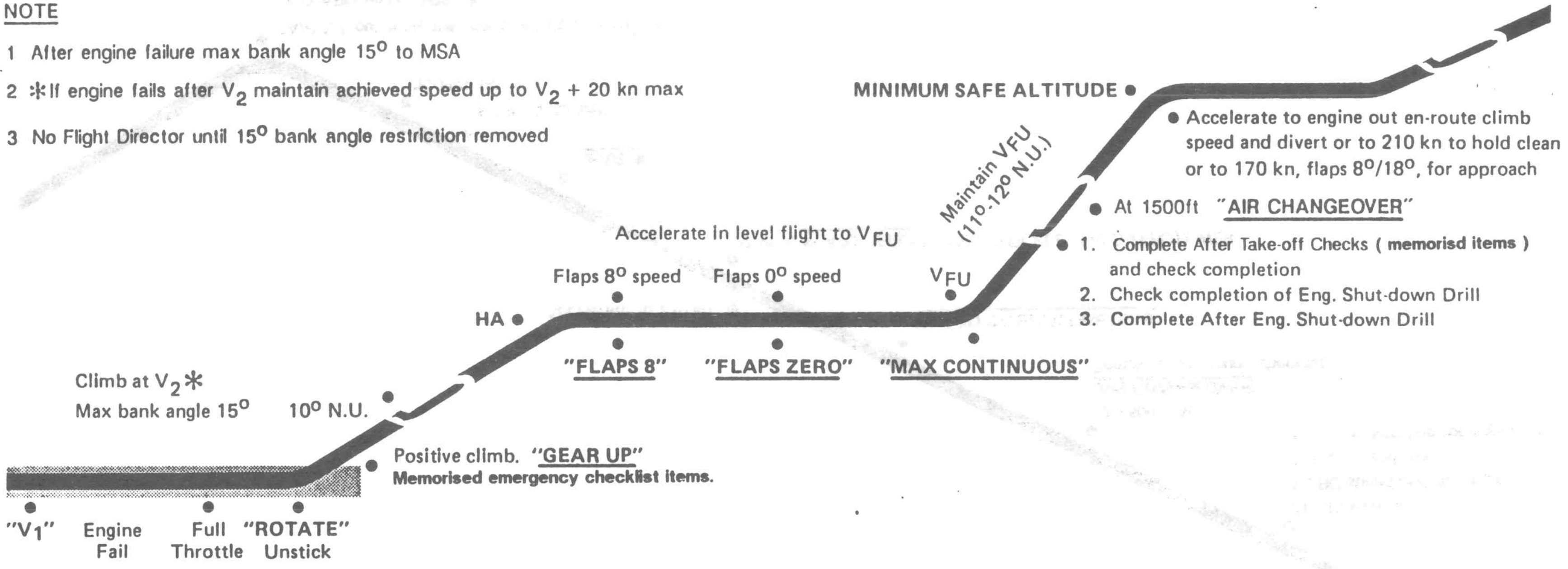

"A/P,A/T out,apply fully power,rotate to 5-10° nu
"GO AROUND,FLAPS 18"
"FLAPS 18"
"POSITVE CLIMB"
"GEAR UP"
Accelerate to 210 kn
At VFU: "FLAPS ZERO" "SPEED CHECKED,FLAPS ZERO,POWER"
"FCS TO STEER,ALTIMETERS"
At 1500' AAL
"AIR CHANGEOVER"
Complete Go around checklist.
At 210 kn,either
1. ERC speed and dirvert,or
2. 210 kn and hold, or
3. 170 kn with flap for approach.

NOTES: 1. Re - trim as speed increases
2. Handling pilot calls are underlined.
3. Initial attitude varies with a/c weight and temprature.
Do not exceed 10° nu.

TWO ENGINE GO AROUND

SUPER ONE-ELEVEN

ENGINE FAILURE ON TAKE-OFF


"V_1"
Engine Fail
Full Throttle
"ROTATE" Unstick
Climb at V_2*
Max bank angle 15°
10° N.U.
Positive climb. "GEAR UP"
Memorised emergency checklist items.
HA
Accelerate in level flight to V_{FU}
Flaps 8° speed
Flaps 0° speed
"FLAPS 8"
"FLAPS ZERO"
V_{FU}
"MAX CONTINUOUS"
Maintain V_{FU} (11°-12° N.U.)
1. Complete After Take-off Checks (memorisd items) and check completion
2. Check completion of Eng. Shut-down Drill
3. Complete After Eng. Shut-down Drill
At 1500ft "AIR CHANGEOVER"
MINIMUM SAFE ALTITUDE
Accelerate to engine out en-route climb speed and divert or to 210 kn to hold clean or to 170 kn, flaps 8°/18°, for approach

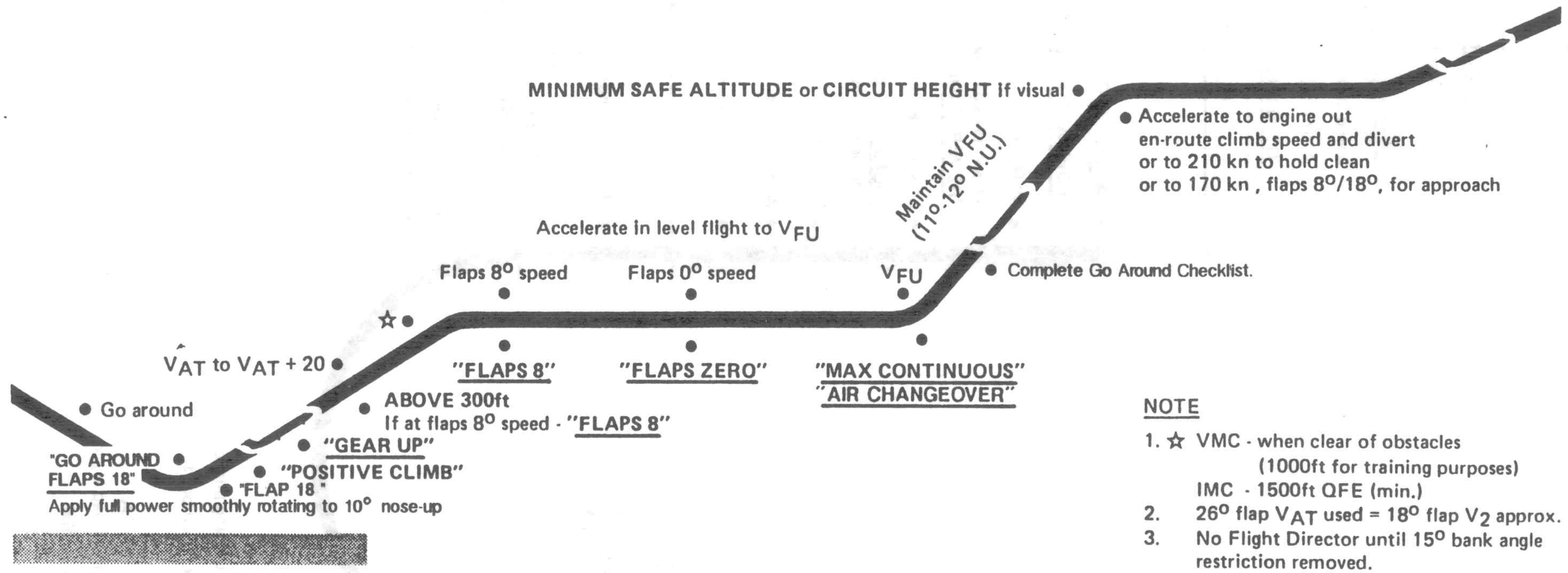
NOTE

1 After engine failure max bank angle 15° to MSA

2 *If engine fails after V_2 maintain achieved speed up to V_2 + 20 kn max

3 No Flight Director until 15° bank angle restriction removed

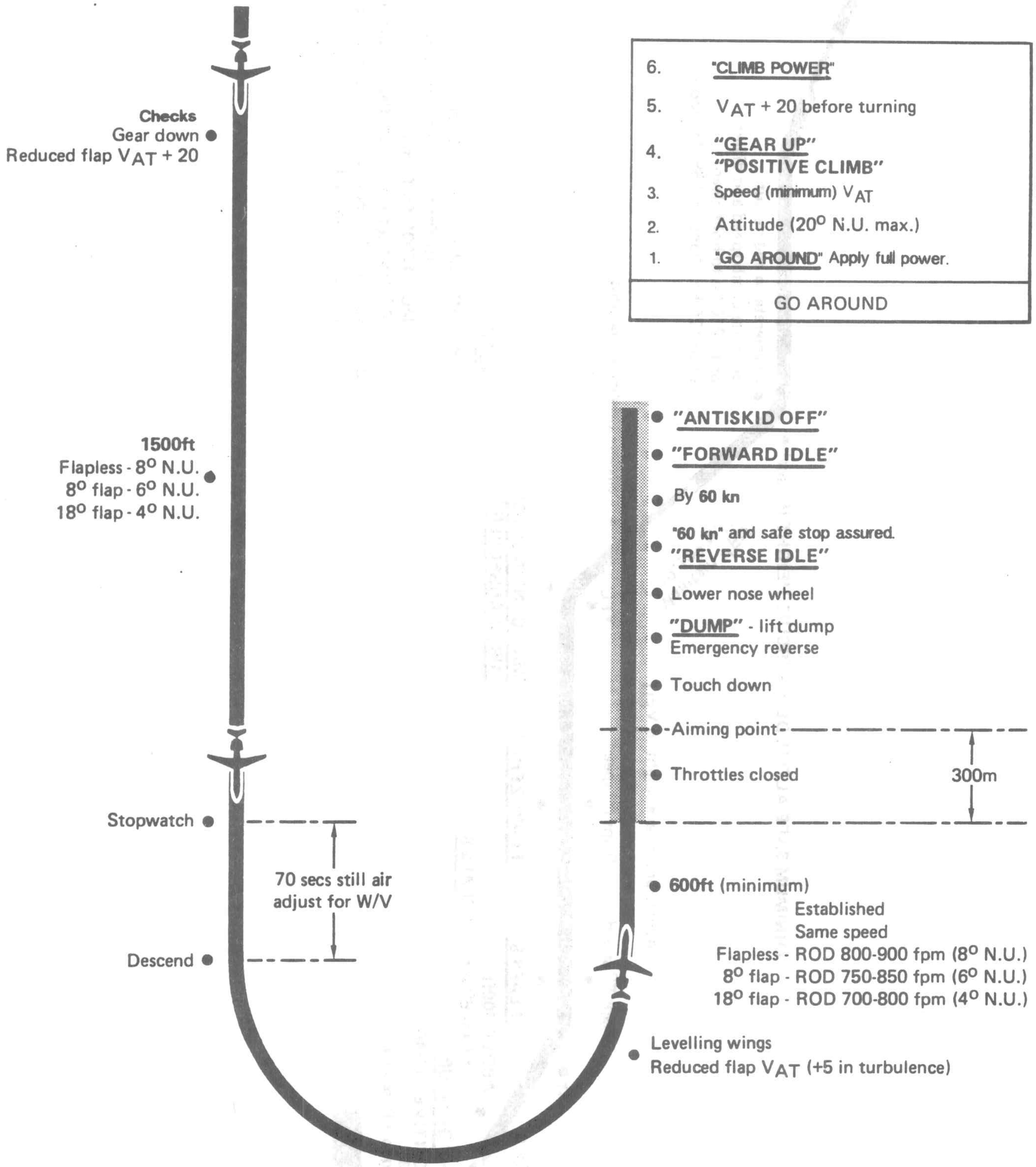
SUPER ONE-ELEVEN


MINIMUM SAFE ALTITUDE or CIRCUIT HEIGHT if visual
Accelerate to engine out en-route climb speed and divert or to 210 kn to hold clean or to 170 kn , flaps 8°/18°, for approach
Maintain VFU (11°-12° N.U.)
Accelerate in level flight to VFU
Flaps 8° speed
Flaps 0° speed
VFU
Complete Go Around Checklist.
VAT to VAT + 20
Go around
"GO AROUND FLAPS 18"
Apply full power smoothly rotating to 10° nose-up
"FLAP 18"
"POSITIVE CLIMB"
"GEAR UP"
ABOVE 300ft
If at flaps 8° speed - "FLAPS 8"
☆
"FLAPS 8"
"FLAPS ZERO"
"MAX CONTINUOUS"
"AIR CHANGEOVER"

NOTE

1. ☆ VMC - when clear of obstacles
(1000ft for training purposes)
IMC - 1500ft QFE (min.)
2. 26° flap V_{AT} used = 18° flap V_2 approx.
3. No Flight Director until 15° bank angle restriction removed.

SINGLE-ENGINE GO AROUND


6. "CLIMB POWER"
5. V_{AT} + 20 before turning
4. "GEAR UP"
"POSITIVE CLIMB"
3. Speed (minimum) V_{AT}
2. Attitude (20° N.U. max.)
1. "GO AROUND" Apply full power.
GO AROUND
Checks
Gear down
Reduced flap V_{AT} + 20
1500ft
Flapless - 8° N.U.
8° flap - 6° N.U.
18° flap - 4° N.U.
Stopwatch
70 secs still air adjust for W/V
Descend
"ANTISKID OFF"
"FORWARD IDLE"
By 60 kn
"60 kn" and safe stop assured.
"REVERSE IDLE"
Lower nose wheel
"DUMP" - lift dump
Emergency reverse
Touch down
Aiming point
Throttles closed
300m
600ft (minimum)
Established
Same speed
Flapless - ROD 800-900 fpm (8° N.U.)
8° flap - ROD 750-850 fpm (6° N.U.)
18° flap - ROD 700-800 fpm (4° N.U.)
Levelling wings
Reduced flap V_{AT} (+5 in turbulence)

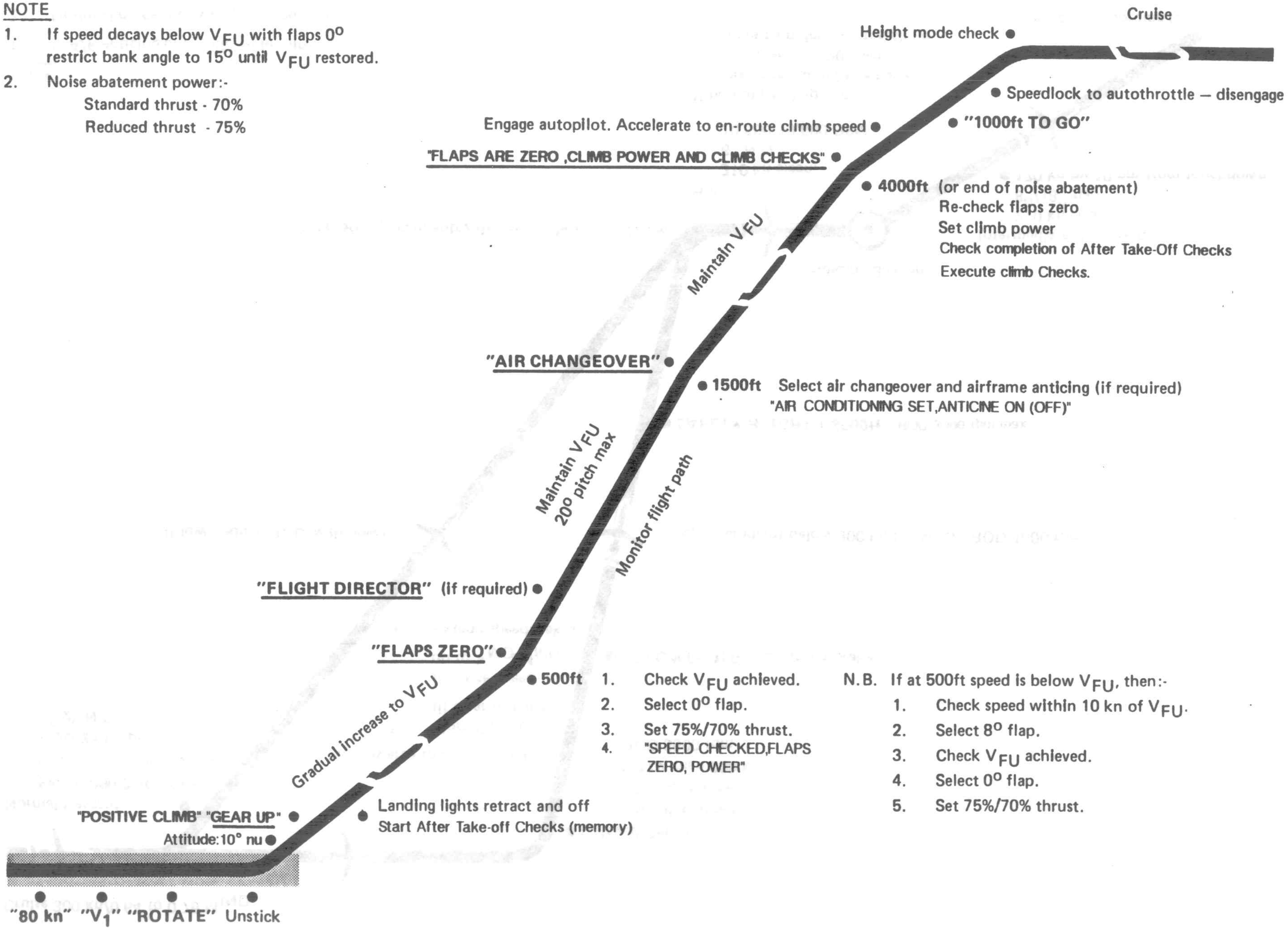
NOTE

1. Check landing weight if landing for training purposes.
2. 11,500 RPM used during climb after overshoot for circuit training.
3. Set inner index to flapless or partial flap V_{AT}.
4. Set first outer index to flapless or partial flap V_{AT}.
5. Set second outer index to flapless or partial flap V_{AT} + 20.

REDUCED FLAP CIRCUIT

NOTE

1. If speed decays below V_{FU} with flaps 0° restrict bank angle to 15° until V_{FU} restored.
2. Noise abatement power:-
   Standard thrust - 70%
   Reduced thrust - 75%



"80 kn" "V_1" "ROTATE" Unstick

Attitude: 10° nu

"POSITIVE CLIMB" "GEAR UP"

Landing lights retract and off
Start After Take-off Checks (memory)

"FLAPS ZERO"

500ft
1. Check V_{FU} achieved.
2. Select 0° flap.
3. Set 75%/70% thrust.
4. "SPEED CHECKED,FLAPS ZERO, POWER"

N.B. If at 500ft speed is below V_{FU}, then:-
1. Check speed within 10 kn of V_{FU}.
2. Select 8° flap.
3. Check V_{FU} achieved.
4. Select 0° flap.
5. Set 75%/70% thrust.

"FLIGHT DIRECTOR" (if required)

"AIR CHANGEOVER"

1500ft Select air changeover and airframe anticing (if required)
"AIR CONDITIONING SET,ANTICINE ON (OFF)"

4000ft (or end of noise abatement)
Re-check flaps zero
Set climb power
Check completion of After Take-Off Checks
Execute climb Checks.

"FLAPS ARE ZERO ,CLIMB POWER AND CLIMB CHECKS"

Engage autopilot. Accelerate to en-route climb speed

"1000ft TO GO"

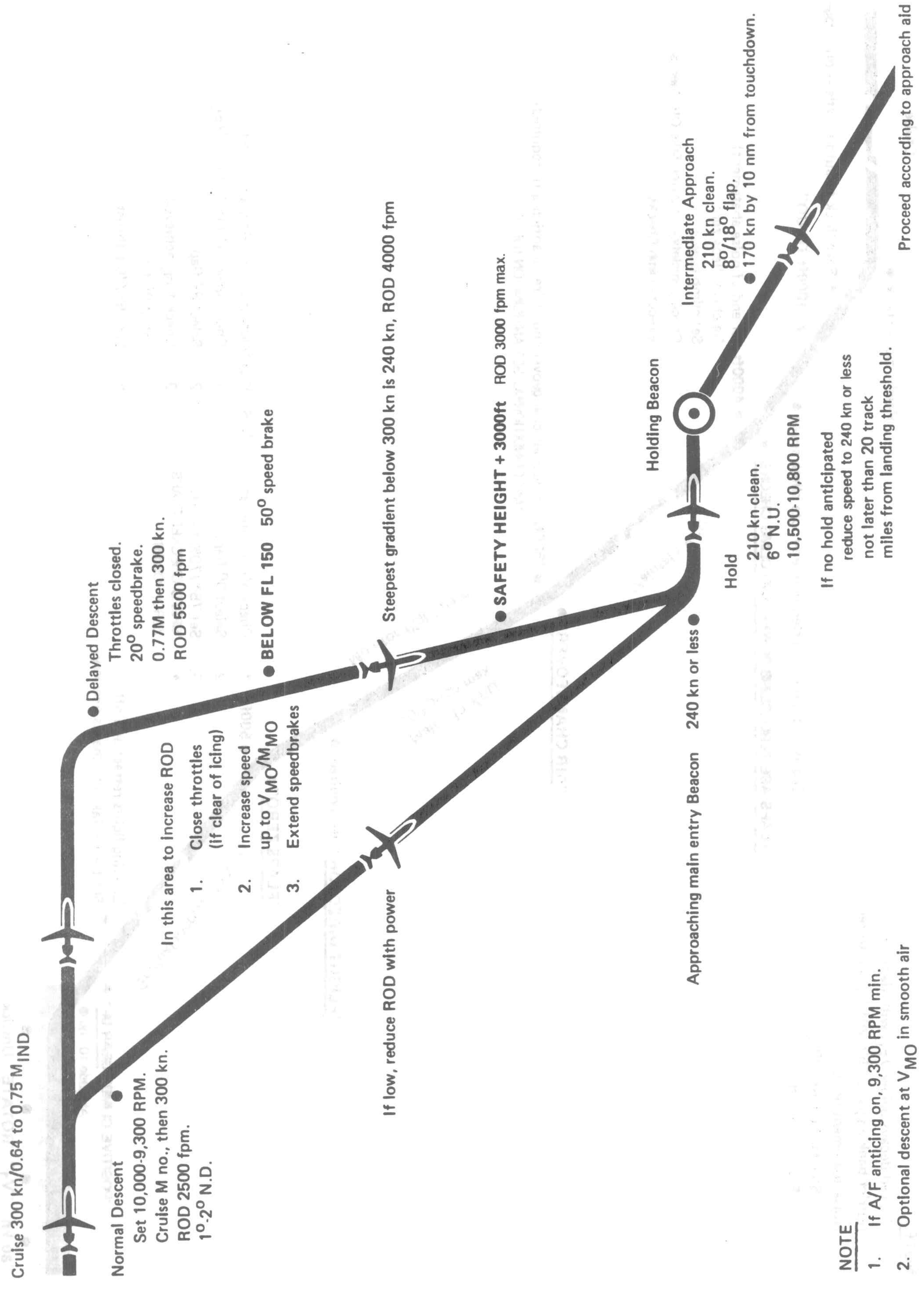
Speedlock to autothrottle — disengage

Height mode check

Cruise

NOISE ABATEMENT (NORMAL) CLIMB PROCEDURE

SUPER ONE-ELEVEN

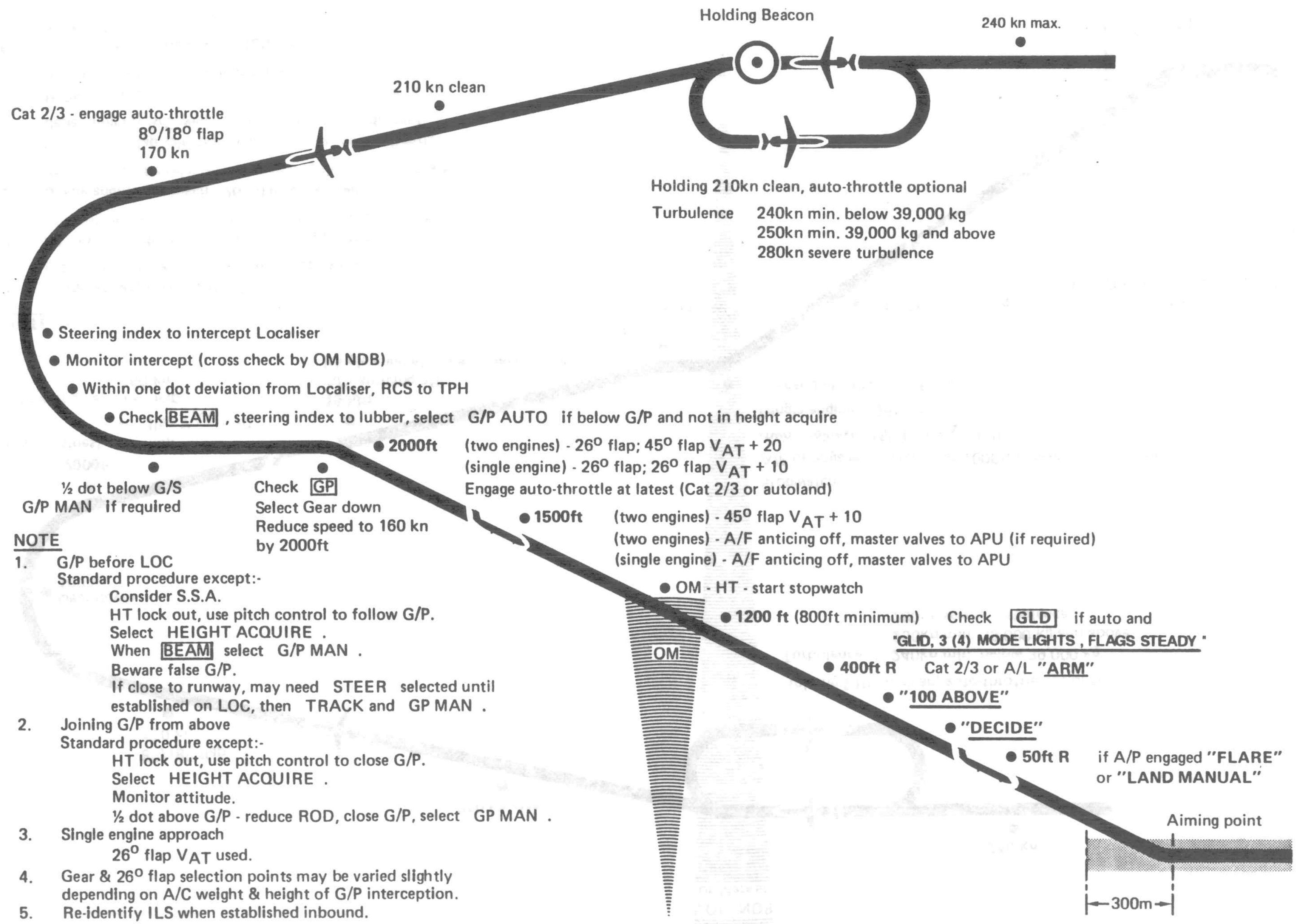

Cruise 300 kn/0.64 to 0.75 M_{IND}
Normal Descent
Set 10,000-9,300 RPM.
Cruise M no., then 300 kn.
ROD 2500 fpm.
1°-2° N.D.
In this area to increase ROD
1. Close throttles (if clear of icing)
2. Increase speed up to V_{MO}/M_{MO}
3. Extend speedbrakes
Delayed Descent
Throttles closed.
20° speedbrake.
0.77M then 300 kn.
ROD 5500 fpm
BELOW FL 150 50° speed brake
Steepest gradient below 300 kn is 240 kn, ROD 4000 fpm
SAFETY HEIGHT + 3000ft ROD 3000 fpm max.
If low, reduce ROD with power
Approaching main entry Beacon 240 kn or less
Holding Beacon
Hold
210 kn clean.
6° N.U.
10,500-10,800 RPM
If no hold anticipated reduce speed to 240 kn or less not later than 20 track miles from landing threshold.
Intermediate Approach
210 kn clean.
8°/18° flap.
170 kn by 10 nm from touchdown.
Proceed according to approach aid

NOTE

1. If A/F anticing on, 9,300 RPM min.
2. Optional descent at V_{MO} in smooth air

DESCENT PROCEDURE

SUPER ONE-ELEVEN

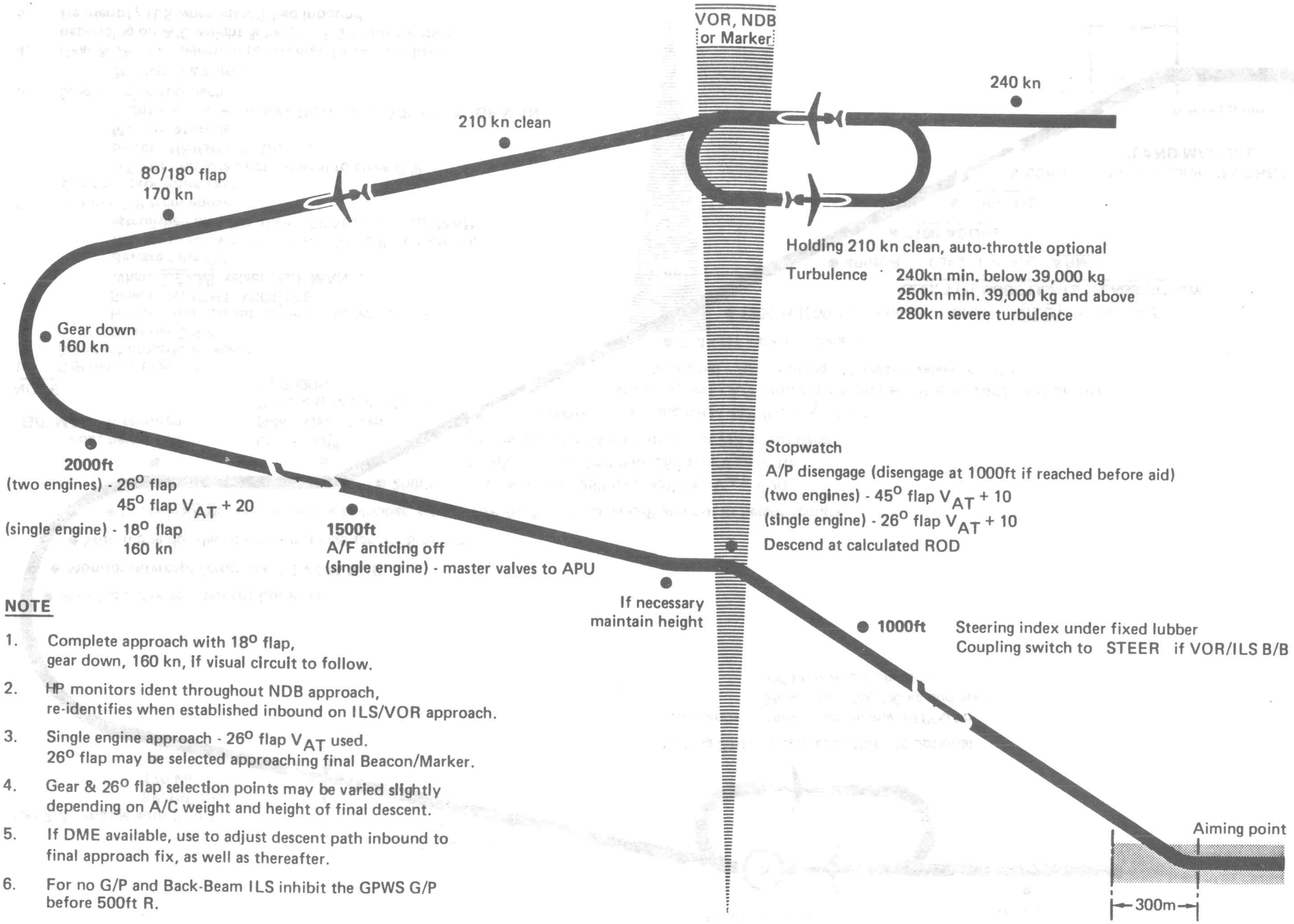

Holding Beacon
240 kn max.
210 kn clean
Cat 2/3 - engage auto-throttle
8°/18° flap
170 kn
Holding 210kn clean, auto-throttle optional
Turbulence 240kn min. below 39,000 kg
250kn min. 39,000 kg and above
280kn severe turbulence
● Steering index to intercept Localiser
● Monitor intercept (cross check by OM NDB)
● Within one dot deviation from Localiser, RCS to TPH
● Check BEAM , steering index to lubber, select G/P AUTO if below G/P and not in height acquire
● 2000ft (two engines) - 26° flap; 45° flap VAT + 20
(single engine) - 26° flap; 26° flap VAT + 10
Engage auto-throttle at latest (Cat 2/3 or autoland)
● ½ dot below G/S
G/P MAN if required
● Check GP
Select Gear down
Reduce speed to 160 kn
by 2000ft
● 1500ft (two engines) - 45° flap VAT + 10
(two engines) - A/F anticing off, master valves to APU (if required)
(single engine) - A/F anticing off, master valves to APU
● OM - HT - start stopwatch
OM
● 1200 ft (800ft minimum) Check GLD if auto and
"GLID, 3 (4) MODE LIGHTS , FLAGS STEADY "
● 400ft R Cat 2/3 or A/L "ARM"
● "100 ABOVE"
● "DECIDE"
● 50ft R if A/P engaged "FLARE"
or "LAND MANUAL"
Aiming point
300m

NOTE

1. G/P before LOC
   Standard procedure except:-
   - Consider S.S.A.
   - HT lock out, use pitch control to follow G/P.
   - Select HEIGHT ACQUIRE .
   - When BEAM select G/P MAN .
   - Beware false G/P.
   - If close to runway, may need STEER selected until established on LOC, then TRACK and GP MAN .
2. Joining G/P from above
   Standard procedure except:-
   - HT lock out, use pitch control to close G/P.
   - Select HEIGHT ACQUIRE .
   - Monitor attitude.
   - ½ dot above G/P - reduce ROD, close G/P, select GP MAN .
3. Single engine approach
   - 26° flap V_{AT} used.
4. Gear & 26° flap selection points may be varied slightly depending on A/C weight & height of G/P interception.
5. Re-identify ILS when established inbound.

ILS APPROACH - TWO & SINGLE ENGINE

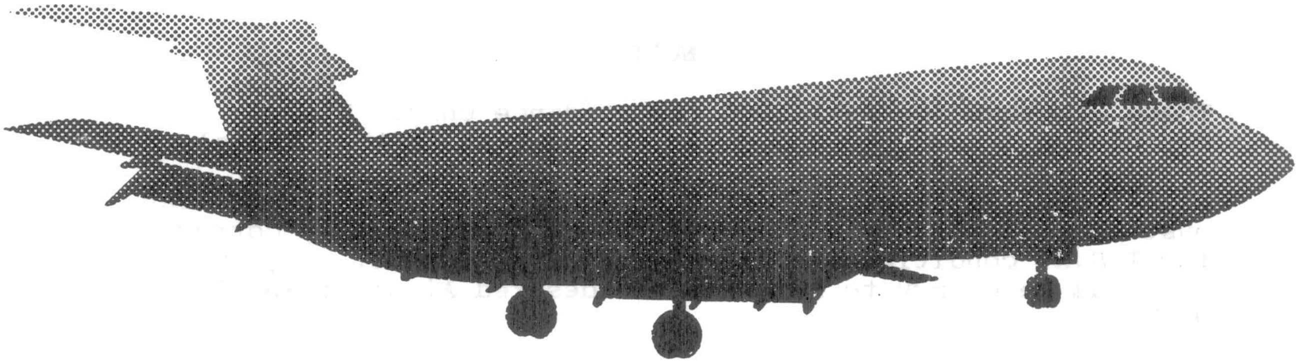
SUPER ONE-ELEVEN


VOR, NDB
or Marker
240 kn
210 kn clean
Holding 210 kn clean, auto-throttle optional
Turbulence · 240kn min. below 39,000 kg
250kn min. 39,000 kg and above
280kn severe turbulence
8°/18° flap
170 kn
Gear down
160 kn
2000ft
(two engines) - 26° flap
45° flap VAT + 20
(single engine) - 18° flap
160 kn
1500ft
A/F anticing off
(single engine) - master valves to APU
If necessary
maintain height
Stopwatch
A/P disengage (disengage at 1000ft if reached before aid)
(two engines) - 45° flap VAT + 10
(single engine) - 26° flap VAT + 10
Descend at calculated ROD
1000ft
Steering index under fixed lubber
Coupling switch to STEER if VOR/ILS B/B
Aiming point
300m

NOTE

1. Complete approach with 18° flap, gear down, 160 kn, if visual circuit to follow.
2. HP monitors ident throughout NDB approach, re-identifies when established inbound on ILS/VOR approach.
3. Single engine approach - 26° flap V_{AT} used. 26° flap may be selected approaching final Beacon/Marker.
4. Gear & 26° flap selection points may be varied slightly depending on A/C weight and height of final descent.
5. If DME available, use to adjust descent path inbound to final approach fix, as well as thereafter.
6. For no G/P and Back-Beam ILS inhibit the GPWS G/P before 500ft R.

ILS (NO G/P), BACKBEAM ILS, VOR, BEACON APPROACH



B1-11

Recommended Procedures

REVISED JANUARY 1989

BRITISH AIRWAYS

NOTE

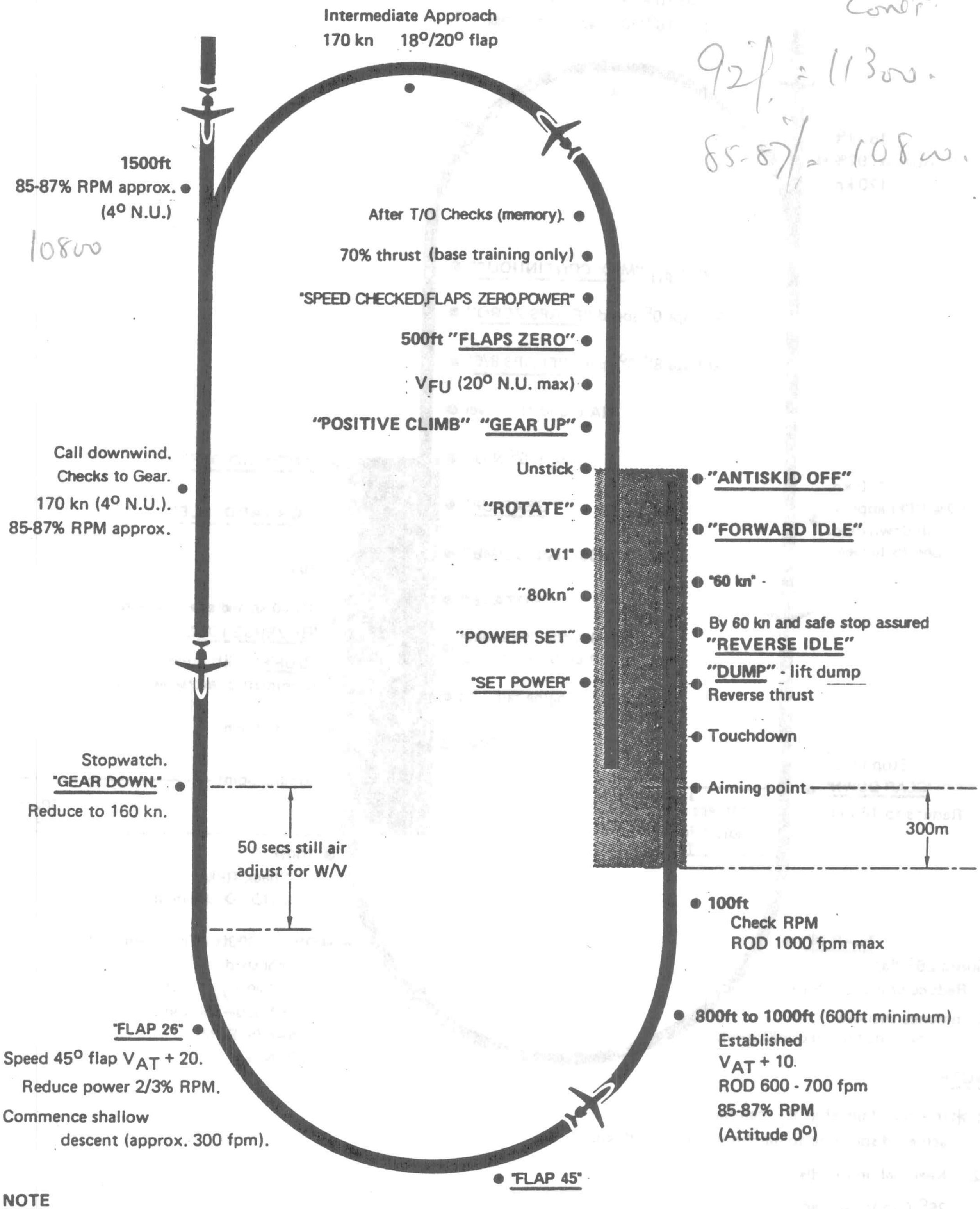
These diagrams are published for guidance only. The definitive procedures are given in the text of this manual.

Where Power Settings and Attitude Indications are given, they must be treated only as a guide, being approximately correct for I.S.A. conditions and Maximum Landing Weight. Adjust these as necessary to maintain the desired Airspeed and Flight Path.

9 9.5 = MAX CONT.

92% = 11300.

85-87% = 10800.

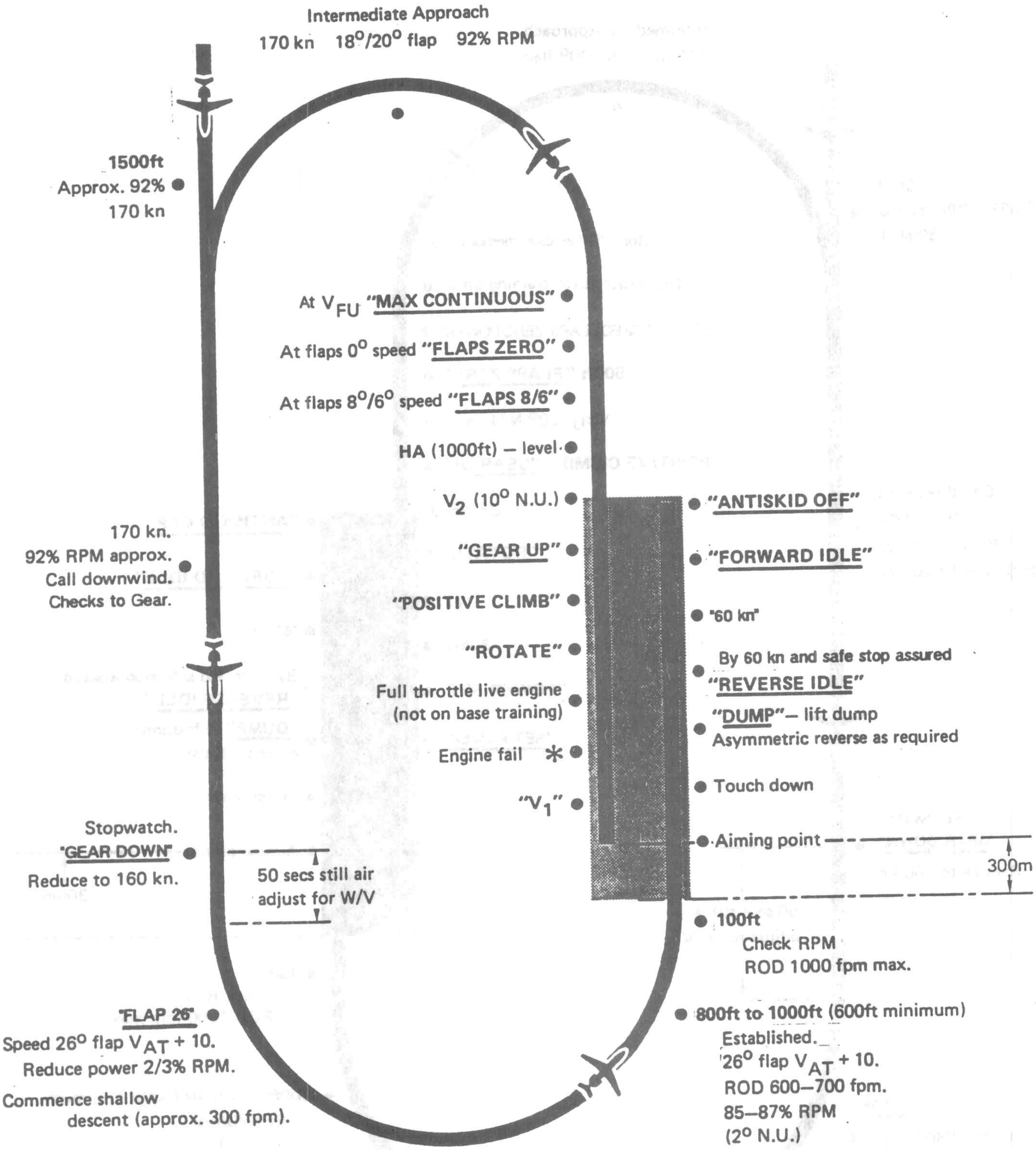


10800

NOTE

1. Guide to approx attitude abbreviated e.g. 4° nose up - (4° N.U.).
2. 92% RPM used during climb for circuit training.
3. 26° flap approach - 2° N.U., 82% RPM on final approach.
4. $\left.\begin{array}{l}26^\circ \text{ flap } V_{AT} \\ 45^\circ \text{ flap } V_{AT} + 10\end{array}\right\} = 18^\circ/20^\circ$ flap V_2 approx.
5. Handling pilot calls are underlined.

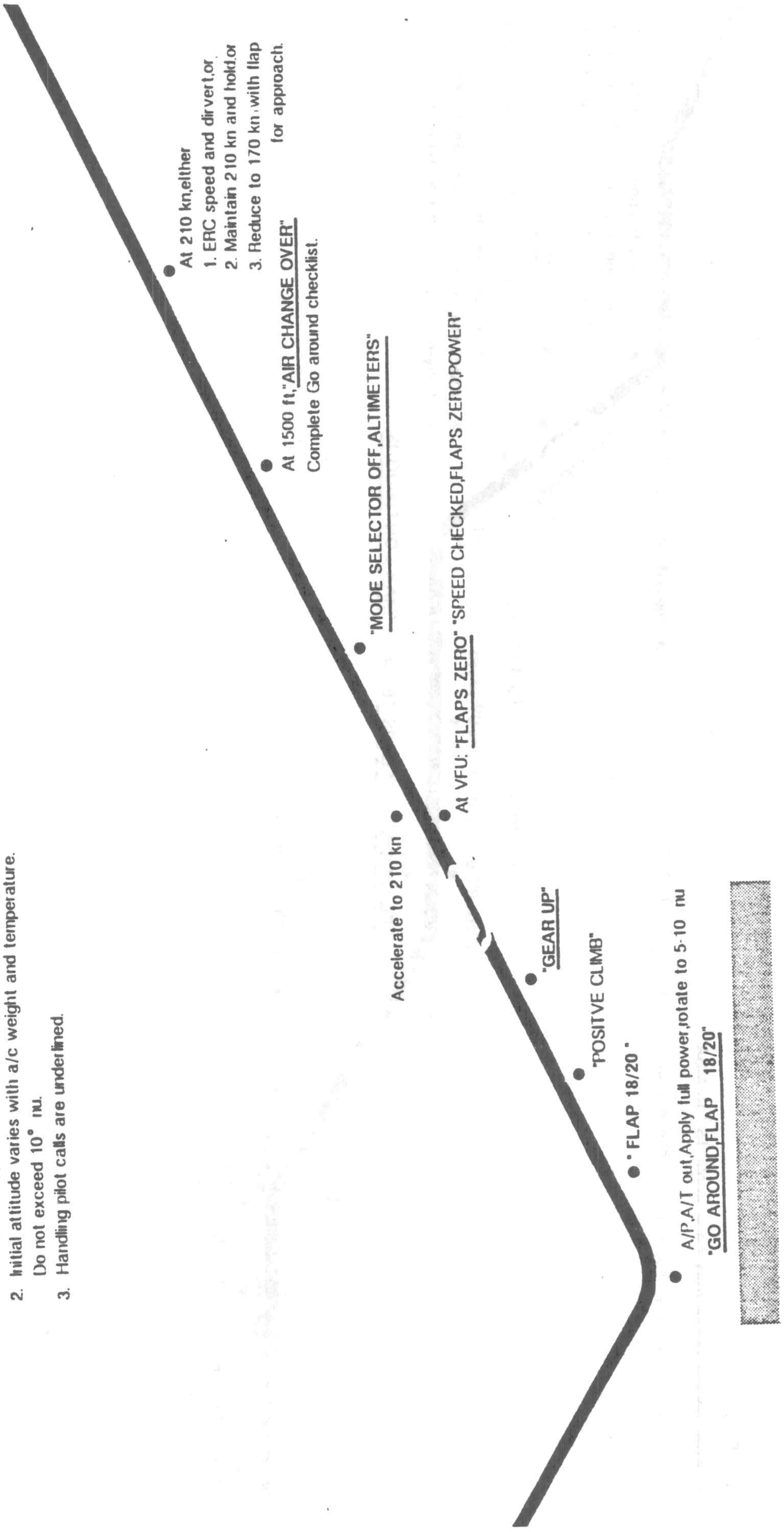
STANDARD CIRCUIT - 6°/8° OR 13°/18° FLAP TAKE-OFF



NOTE

1. ✱ If engine fails after V_2 maintain achieved speed up to maximum of V_2 + 20 kn.
2. Keep ball in middle at all times.
3. 26° flap V_{AT} used.
4. 26° flap V_{AT} = 18°/20° flap V_2 approx.
5. Max. bank angle 15° to MSA or Circuit Height.
6. Handling pilot calls are underlined.

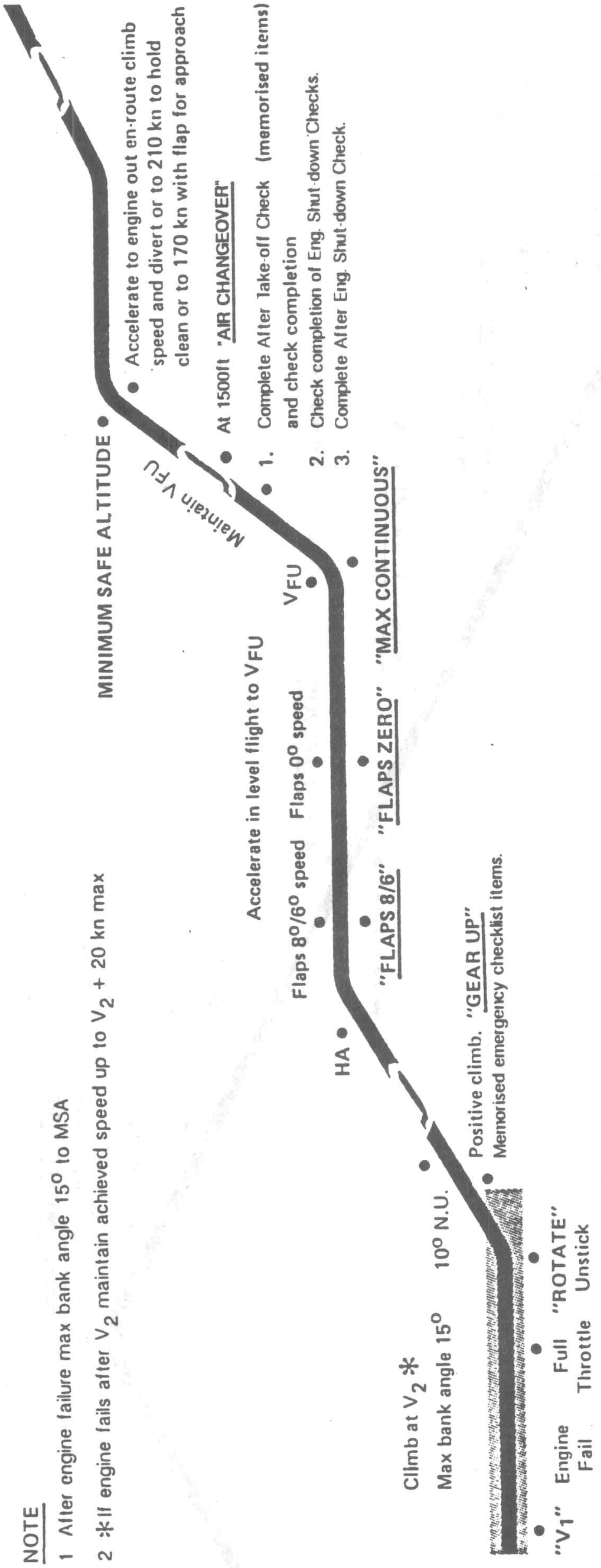
SINGLE ENGINE CIRCUIT



A/P,A/T out,Apply full power,rotate to 5-10 nu
"GO AROUND,FLAP 18/20"
" FLAP 18/20 "
"POSITIVE CLIMB"
"GEAR UP"
Accelerate to 210 kn
At VFU: "FLAPS ZERO" "SPEED CHECKED,FLAPS ZERO,POWER"
"MODE SELECTOR OFF,ALTIMETERS"
At 1500 ft,"AIR CHANGE OVER"
Complete Go around checklist.
At 210 kn,either
1. ERC speed and divert,or
2. Maintain 210 kn and hold,or
3. Reduce to 170 kn with flap for approach.

NOTES: 1. Re - trim as speed increases
2. Initial attitude varies with a/c weight and temperature. Do not exceed 10° nu.
3. Handling pilot calls are underlined.

TWO ENGINE GO AROUND

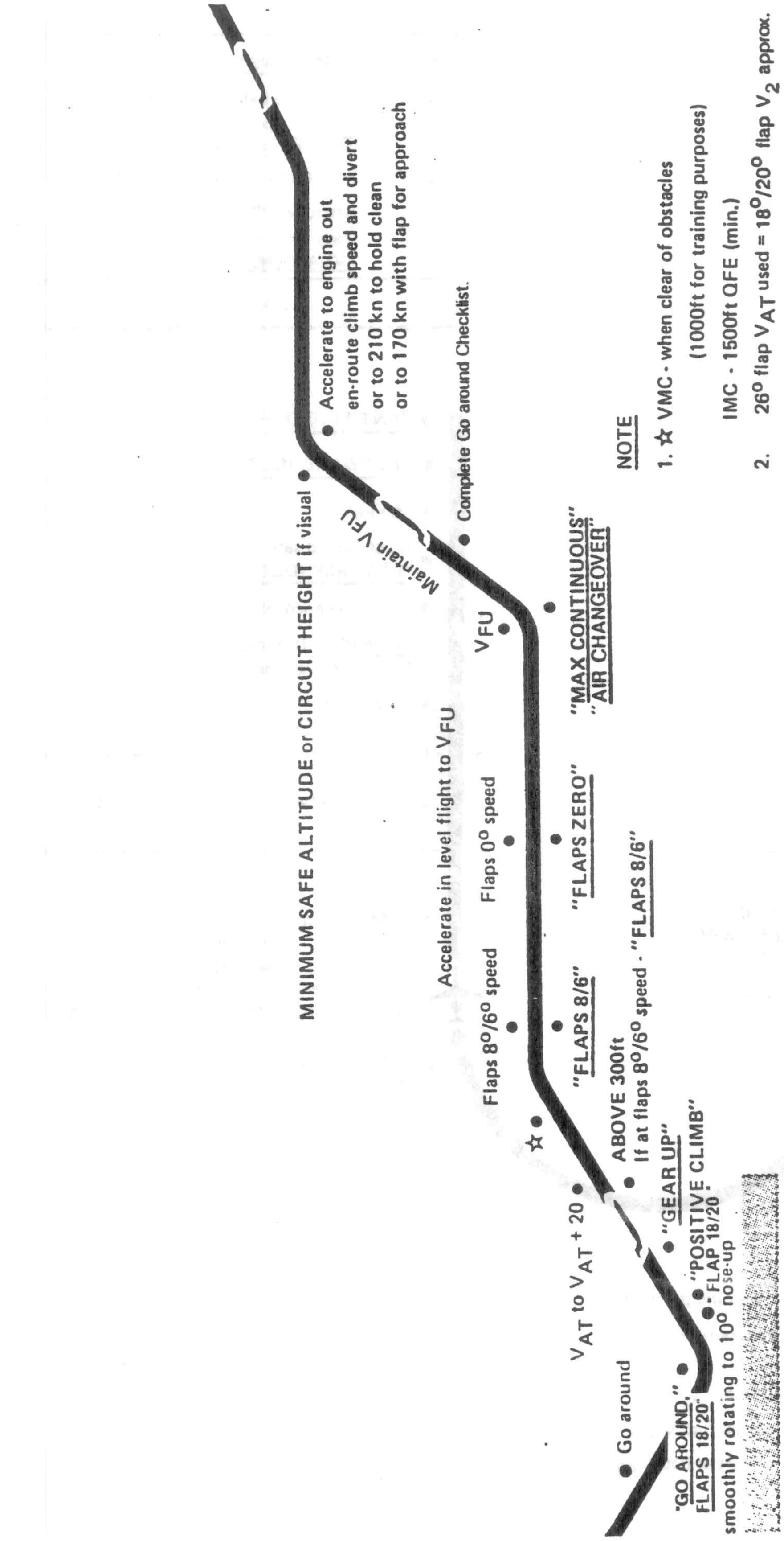

"V1"
Engine Fail
Full Throttle
"ROTATE" Unstick
Climb at V_2*
Max bank angle 15°
10° N.U.
Positive climb. "GEAR UP"
Memorised emergency checklist items.
HA
Flaps 8°/6° speed
"FLAPS 8/6"
Accelerate in level flight to V_{FU}
Flaps 0° speed
"FLAPS ZERO"
V_{FU}
"MAX CONTINUOUS"
Maintain V_{FU}
MINIMUM SAFE ALTITUDE
At 1500ft "AIR CHANGEOVER"
1. Complete After Take-off Check (memorised items) and check completion
2. Check completion of Eng. Shut-down Checks.
3. Complete After Eng. Shut-down Check.
Accelerate to engine out en-route climb speed and divert or to 210 kn to hold clean or to 170 kn with flap for approach

NOTE

1 After engine failure max bank angle 15° to MSA

2 *If engine fails after V_2 maintain achieved speed up to V_2 + 20 kn max

ENGINE FAILURE ON TAKE-OFF


"GO AROUND"
FLAPS 18/20"
smoothly rotating to 10° nose-up
Go around
V_{AT} to V_{AT} + 20
"FLAP 18/20"
"POSITIVE CLIMB"
"GEAR UP"
ABOVE 300ft
If at flaps 8°/6° speed - "FLAPS 8/6"
☆
Flaps 8°/6° speed
"FLAPS 8/6"
Accelerate in level flight to V_{FU}
Flaps 0° speed
"FLAPS ZERO"
MINIMUM SAFE ALTITUDE or CIRCUIT HEIGHT if visual
V_{FU}
"MAX CONTINUOUS"
"AIR CHANGEOVER"
Maintain V_{FU}
Complete Go around Checklist.
Accelerate to engine out en-route climb speed and divert or to 210 kn to hold clean or to 170 kn with flap for approach

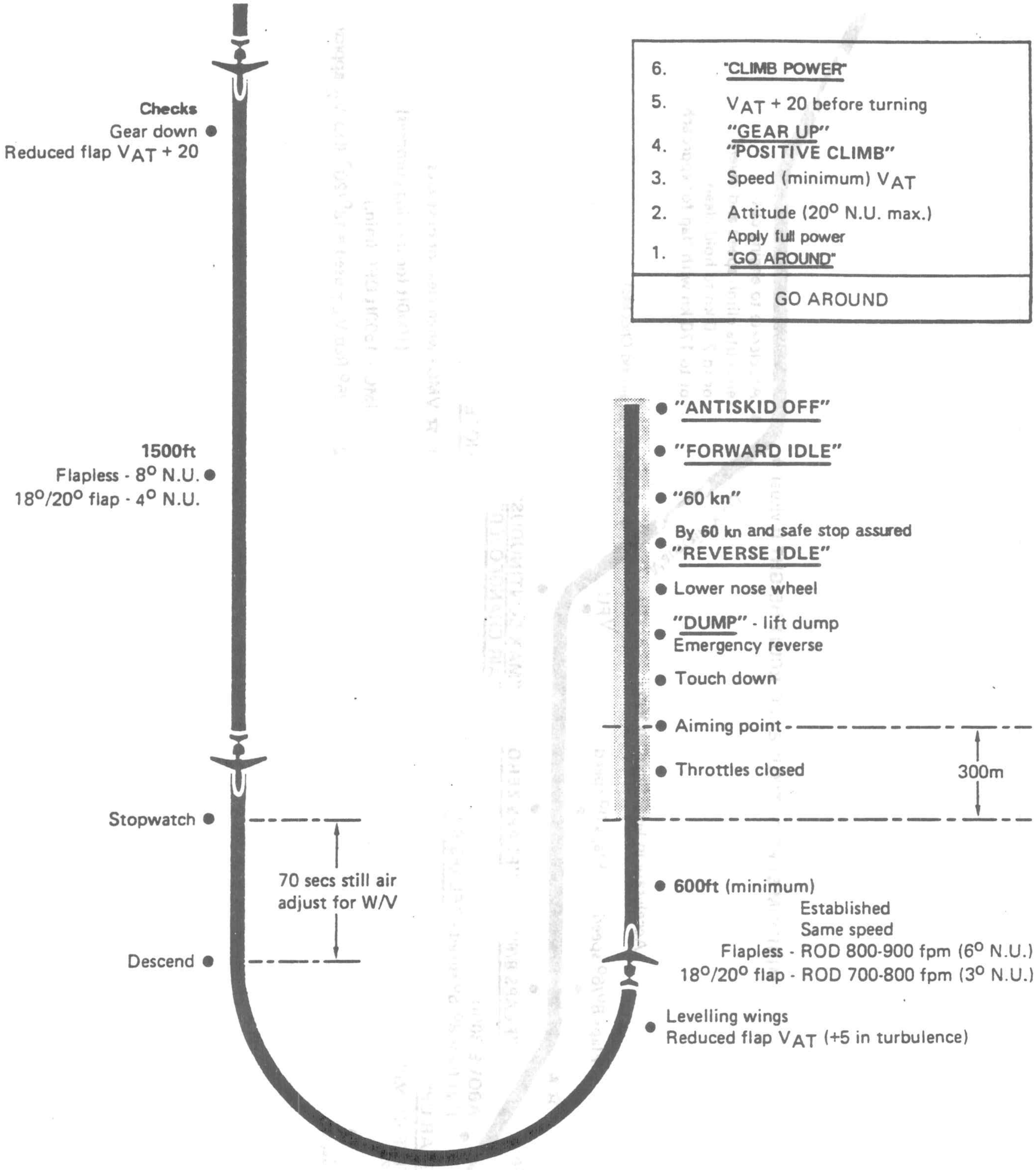
NOTE

1. ☆ VMC - when clear of obstacles (1000ft for training purposes)

   IMC - 1500ft QFE (min.)

2. 26° flap V_{AT} used = 18°/20° flap V_2 approx.

SINGLE-ENGINE GO AROUND



NOTE

1. Check landing weight if landing for training purposes.
2. 92% RPM used during climb after go around for circuit training.
3. Set inner index to flapless or partial flap V_{AT}.
4. Set first outer index to flapless or partial flap V_{AT}.
5. Set second outer index to flapless or partial flap V_{AT} + 20.

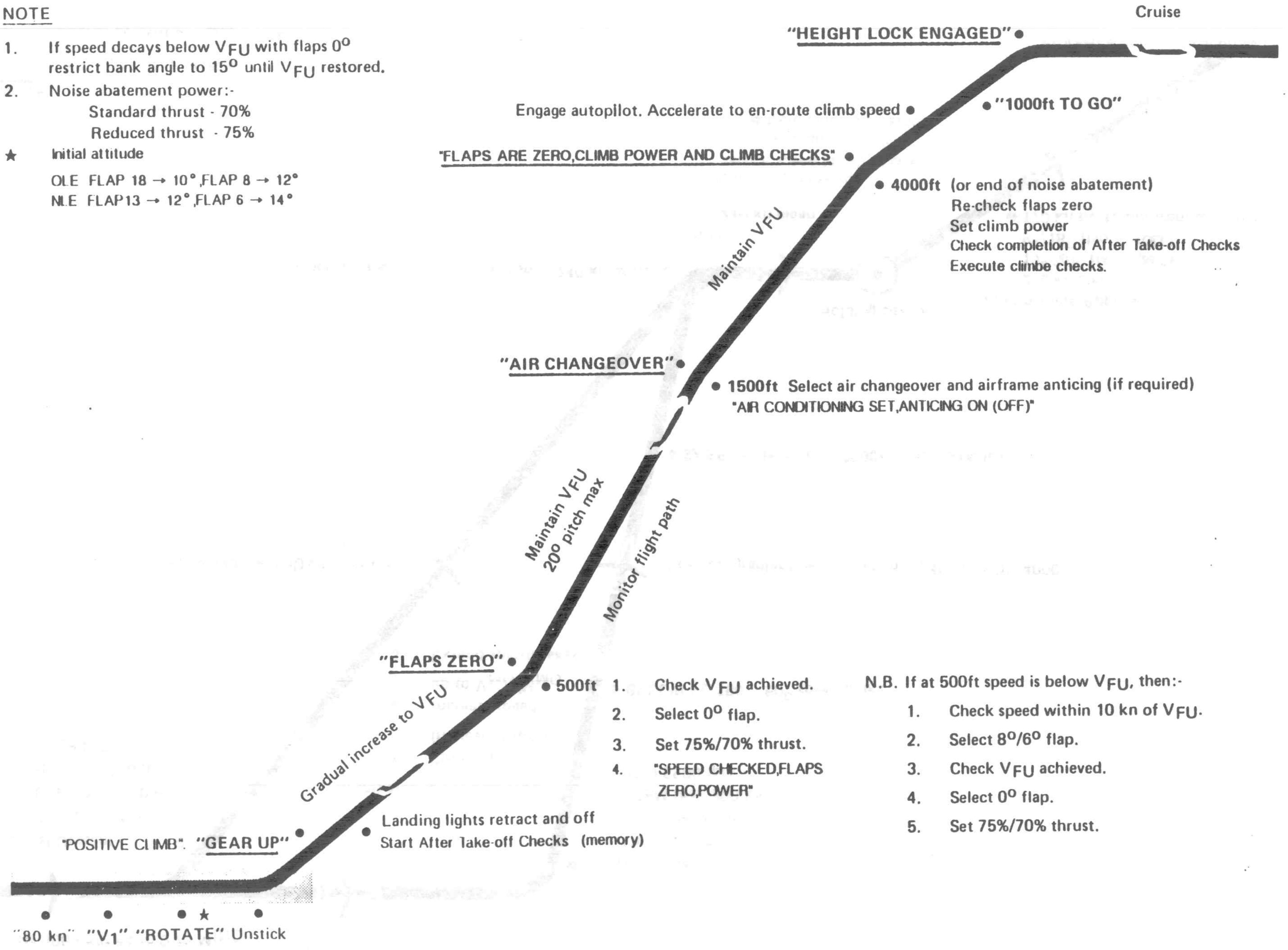
REDUCED FLAP CIRCUIT

NOTE

1. If speed decays below V_{FU} with flaps 0° restrict bank angle to 15° until V_{FU} restored.
2. Noise abatement power:-
   Standard thrust - 70%
   Reduced thrust - 75%

★ Initial attitude

OLE FLAP 18 → 10°,FLAP 8 → 12°
NLE FLAP13 → 12°,FLAP 6 → 14°



"POSITIVE CLIMB". "GEAR UP"

Landing lights retract and off
Start After Take-off Checks (memory)

"FLAPS ZERO"

500ft
1. Check V_{FU} achieved.
2. Select 0° flap.
3. Set 75%/70% thrust.
4. "SPEED CHECKED,FLAPS ZERO,POWER"

N.B. If at 500ft speed is below V_{FU}, then:-
1. Check speed within 10 kn of V_{FU}.
2. Select 8°/6° flap.
3. Check V_{FU} achieved.
4. Select 0° flap.
5. Set 75%/70% thrust.

"AIR CHANGEOVER"

1500ft Select air changeover and airframe anticing (if required)
"AIR CONDITIONING SET,ANTICING ON (OFF)"

"FLAPS ARE ZERO,CLIMB POWER AND CLIMB CHECKS"

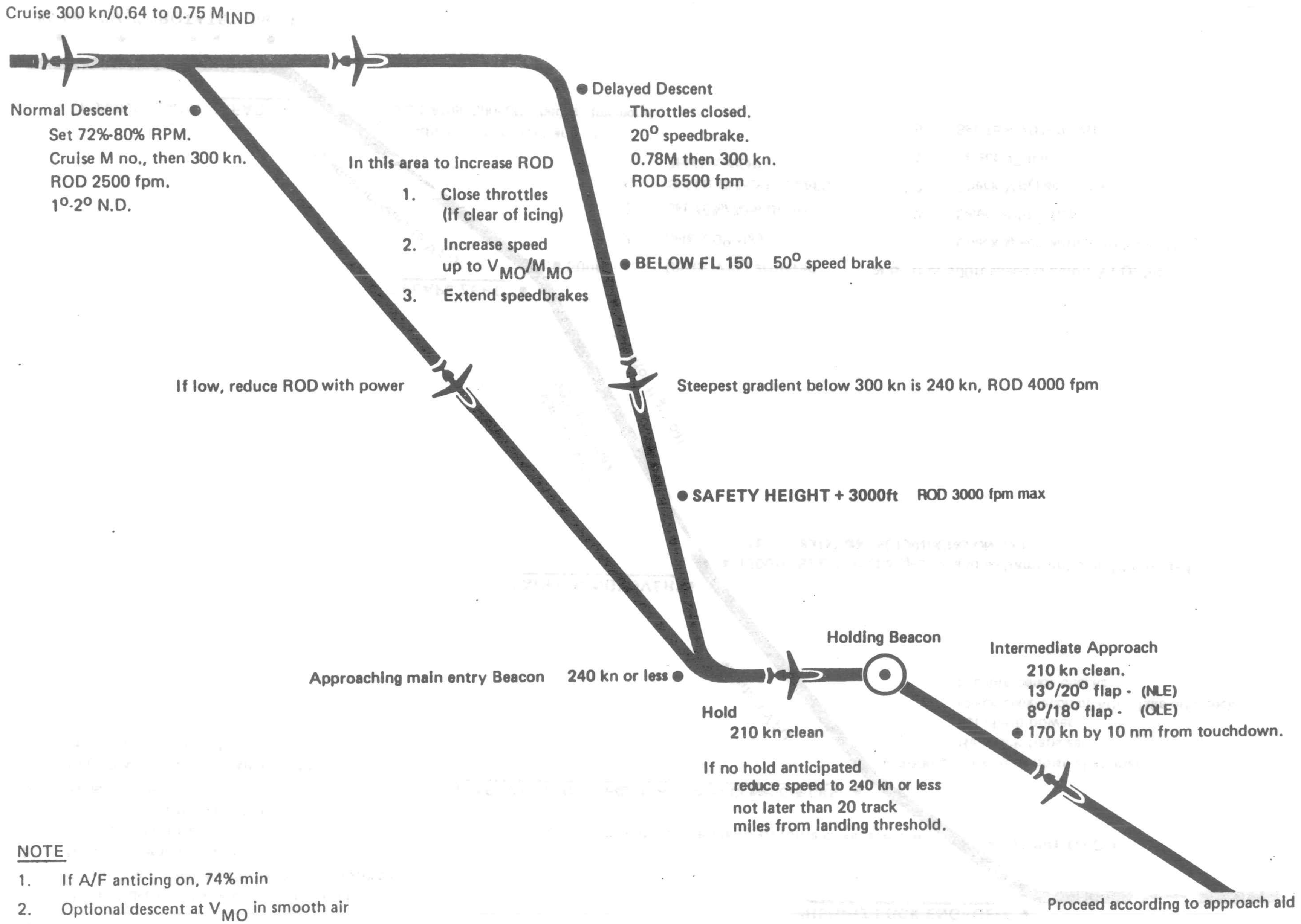
4000ft (or end of noise abatement)
Re-check flaps zero
Set climb power
Check completion of After Take-off Checks
Execute climbe checks.

Engage autopilot. Accelerate to en-route climb speed

"1000ft TO GO"

"HEIGHT LOCK ENGAGED"

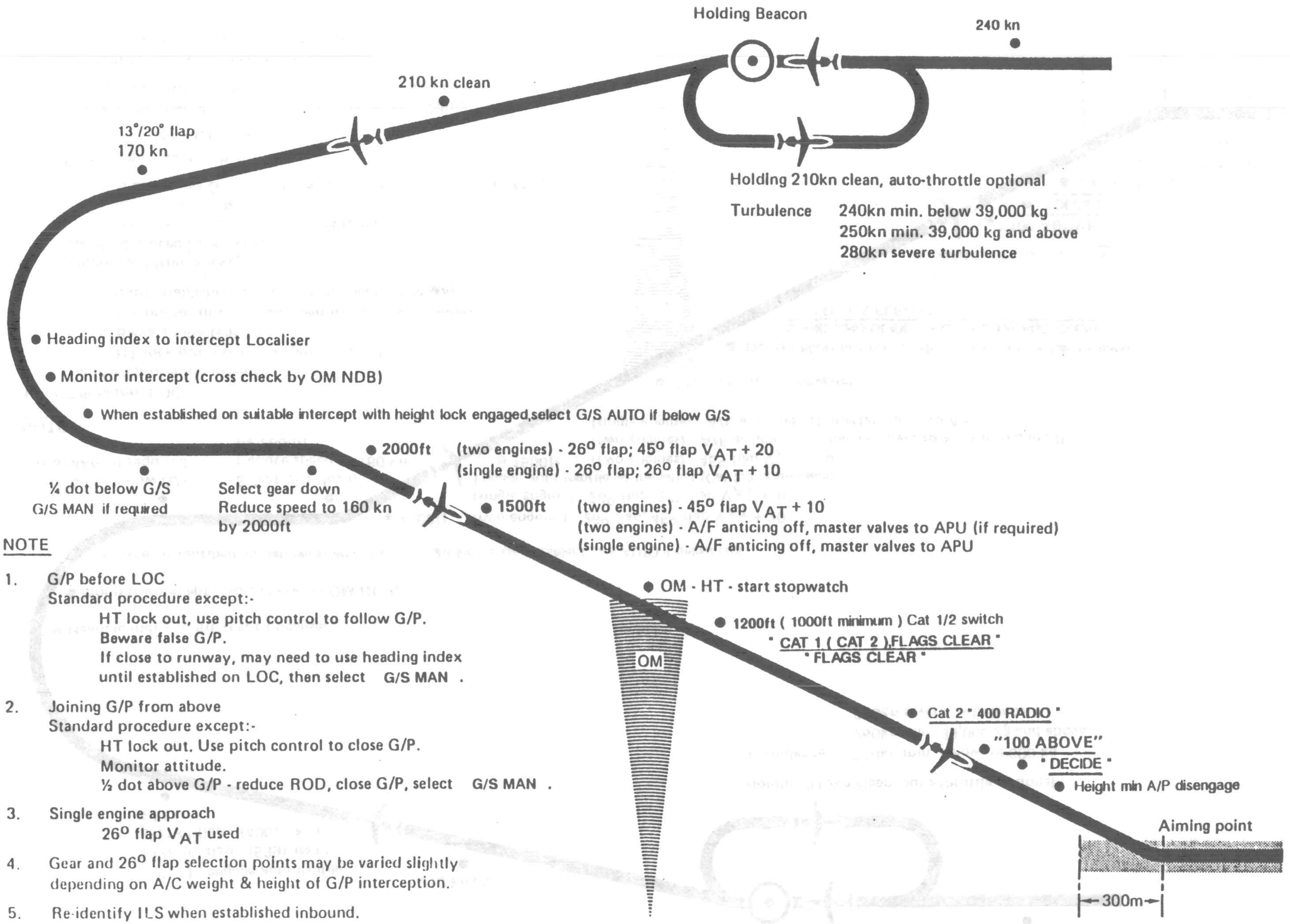
NOISE ABATEMENT (NORMAL) CLIMB PROCEDURE


Cruise 300 kn/0.64 to 0.75 M_{IND}
Normal Descent
Set 72%-80% RPM.
Cruise M no., then 300 kn.
ROD 2500 fpm.
1°-2° N.D.
In this area to increase ROD
1. Close throttles (If clear of icing)
2. Increase speed up to V_{MO}/M_{MO}
3. Extend speedbrakes
Delayed Descent
Throttles closed.
20° speedbrake.
0.78M then 300 kn.
ROD 5500 fpm
BELOW FL 150 50° speed brake
If low, reduce ROD with power
Steepest gradient below 300 kn is 240 kn, ROD 4000 fpm
SAFETY HEIGHT + 3000ft ROD 3000 fpm max
Approaching main entry Beacon
240 kn or less
Holding Beacon
Hold
210 kn clean
If no hold anticipated reduce speed to 240 kn or less not later than 20 track miles from landing threshold.
Intermediate Approach
210 kn clean.
13°/20° flap - (NLE)
8°/18° flap - (OLE)
170 kn by 10 nm from touchdown.
Proceed according to approach aid

NOTE

1. If A/F anticing on, 74% min
2. Optional descent at V_{MO} in smooth air

DESCENT PROCEDURE


Holding Beacon
240 kn
210 kn clean
13°/20° flap
170 kn
Holding 210kn clean, auto-throttle optional
Turbulence 240kn min. below 39,000 kg
250kn min. 39,000 kg and above
280kn severe turbulence
Heading index to intercept Localiser
Monitor intercept (cross check by OM NDB)
When established on suitable intercept with height lock engaged,select G/S AUTO if below G/S
2000ft (two engines) - 26° flap; 45° flap V AT + 20
(single engine) - 26° flap; 26° flap V AT + 10
¼ dot below G/S
G/S MAN if required
Select gear down
Reduce speed to 160 kn
by 2000ft
1500ft (two engines) - 45° flap V AT + 10
(two engines) - A/F anticing off, master valves to APU (if required)
(single engine) - A/F anticing off, master valves to APU
OM - HT - start stopwatch
OM
1200ft (1000ft minimum) Cat 1/2 switch
" CAT 1 (CAT 2),FLAGS CLEAR "
" FLAGS CLEAR "
Cat 2 " 400 RADIO "
"100 ABOVE"
" DECIDE "
Height min A/P disengage
Aiming point
300m

NOTE

1. G/P before LOC
Standard procedure except:-
HT lock out, use pitch control to follow G/P.
Beware false G/P.
If close to runway, may need to use heading index until established on LOC, then select G/S MAN .

2. Joining G/P from above
Standard procedure except:-
HT lock out. Use pitch control to close G/P.
Monitor attitude.
½ dot above G/P - reduce ROD, close G/P, select G/S MAN .

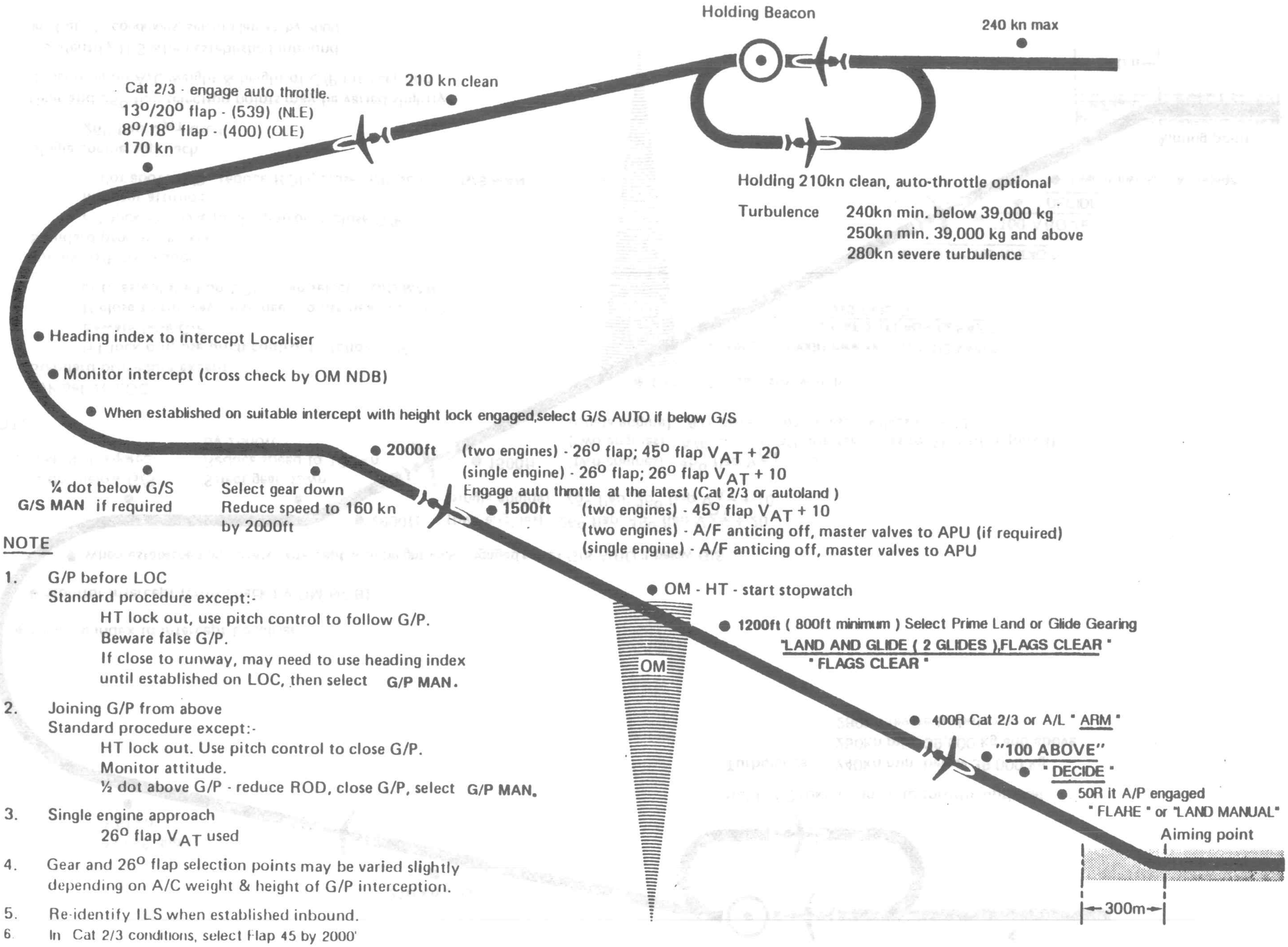
3. Single engine approach
26° flap V_{AT} used

4. Gear and 26° flap selection points may be varied slightly depending on A/C weight & height of G/P interception.

5. Re-identify ILS when established inbound.

6 In Cat 2 conditions, select Flap 45 by 2000'

ILS APPROACH - TWO & SINGLE ENGINE (539 ONLY)


Holding Beacon
240 kn max
210 kn clean
Cat 2/3 - engage auto throttle.
13°/20° flap - (539) (NLE)
8°/18° flap - (400) (OLE)
170 kn
Holding 210kn clean, auto-throttle optional
Turbulence 240kn min. below 39,000 kg
250kn min. 39,000 kg and above
280kn severe turbulence
Heading index to intercept Localiser
Monitor intercept (cross check by OM NDB)
When established on suitable intercept with height lock engaged,select G/S AUTO if below G/S
2000ft (two engines) - 26° flap; 45° flap VAT + 20
(single engine) - 26° flap; 26° flap VAT + 10
Engage auto throttle at the latest (Cat 2/3 or autoland)
¼ dot below G/S
G/S MAN if required
Select gear down
Reduce speed to 160 kn
by 2000ft
1500ft (two engines) - 45° flap VAT + 10
(two engines) - A/F anticing off, master valves to APU (if required)
(single engine) - A/F anticing off, master valves to APU
OM - HT - start stopwatch
OM
1200ft (800ft minimum) Select Prime Land or Glide Gearing
'LAND AND GLIDE (2 GLIDES),FLAGS CLEAR '
' FLAGS CLEAR '
400R Cat 2/3 or A/L ' ARM '
"100 ABOVE"
' DECIDE '
50R it A/P engaged
" FLARE " or 'LAND MANUAL'
Aiming point
300m

NOTE

1. G/P before LOC
   Standard procedure except:-
   HT lock out, use pitch control to follow G/P.
   Beware false G/P.
   If close to runway, may need to use heading index until established on LOC, then select **G/P MAN.**

2. Joining G/P from above
   Standard procedure except:-
   HT lock out. Use pitch control to close G/P.
   Monitor attitude.
   ½ dot above G/P - reduce ROD, close G/P, select **G/P MAN.**

3. Single engine approach
   26° flap V_{AT} used

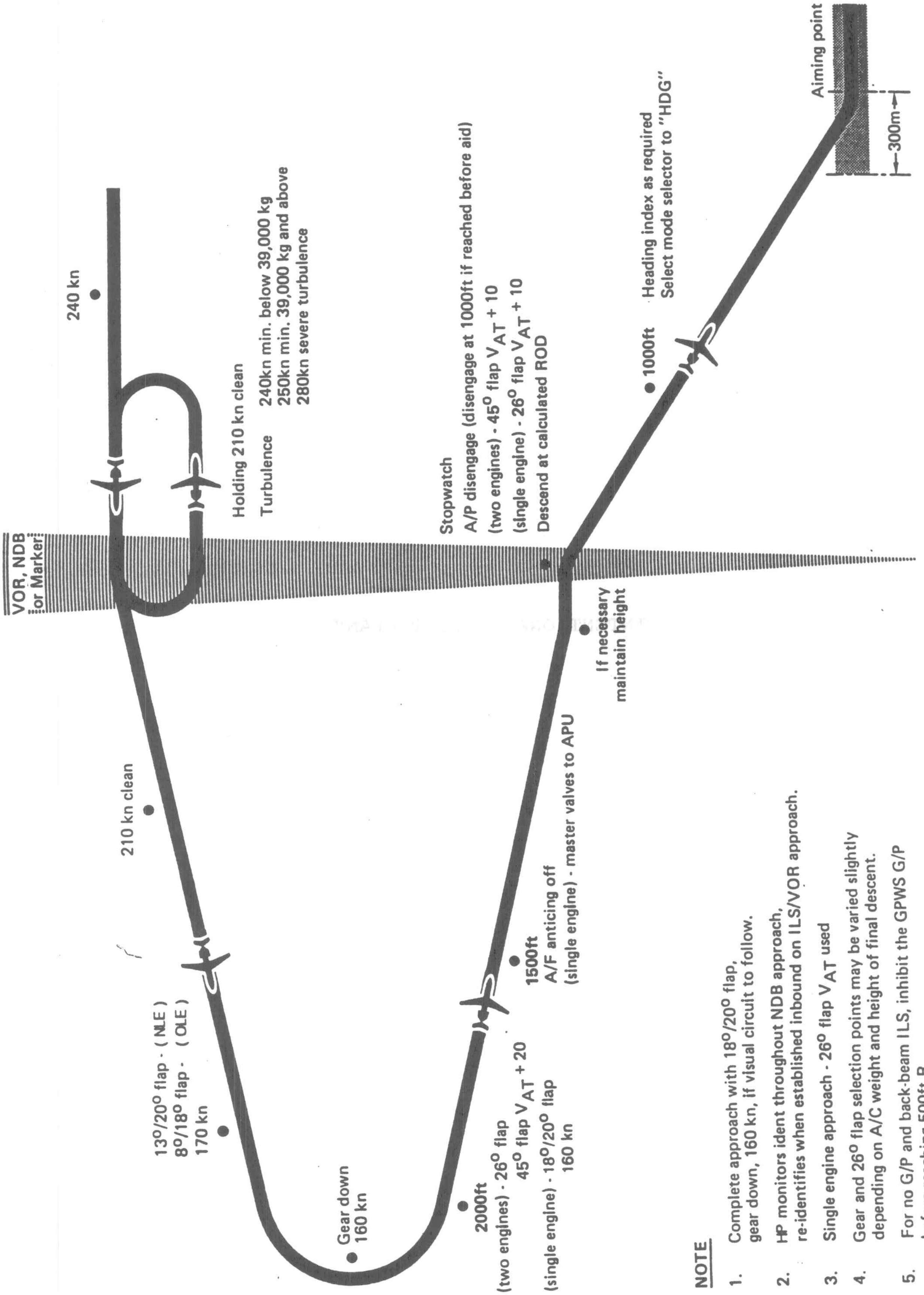
4. Gear and 26° flap selection points may be varied slightly depending on A/C weight & height of G/P interception.

5. Re-identify ILS when established inbound.

6. In Cat 2/3 conditions, select Flap 45 by 2000'

ILS APPROACH - TWO & SINGLE ENGINE (NOT 539)

B1-11


Aiming point
300m
Heading index as required
Select mode selector to "HDG"
1000ft
240 kn
Holding 210 kn clean
Turbulence 240kn min. below 39,000 kg
250kn min. 39,000 kg and above
280kn severe turbulence
Stopwatch
A/P disengage (disengage at 1000ft if reached before aid)
(two engines) - 45° flap VAT + 10
(single engine) - 26° flap VAT + 10
Descend at calculated ROD
VOR, NDB or Marker
If necessary maintain height
210 kn clean
1500ft
A/F anticing off
(single engine) - master valves to APU
13°/20° flap - (NLE)
8°/18° flap - (OLE)
170 kn
Gear down
160 kn
2000ft
(two engines) - 26° flap
45° flap VAT + 20
(single engine) - 18°/20° flap
160 kn

NOTE

1. Complete approach with 18°/20° flap, gear down, 160 kn, if visual circuit to follow.
2. HP monitors ident throughout NDB approach, re-identifies when established inbound on ILS/VOR approach.
3. Single engine approach - 26° flap V_{AT} used
4. Gear and 26° flap selection points may be varied slightly depending on A/C weight and height of final descent.
5. For no G/P and back-beam ILS, inhibit the GPWS G/P before reaching 500ft R.

ILS (NO G/P), BACKBEAM ILS, VOR, BEACON APPROACH

INTENTIONALLY LEFT BLANK

CONTENTS

TURBULENCE 1-2-1
  Take-off
  Climb, Cruise and Descent
  Light to Moderate Turbulence
  Holding
  Landing

WINDSHEAR 1-2-3

ICE AND RAIN 1-2-8

  BEFORE TAKE-OFF 1-2-8
    Exterior Inspection
    APU
    Engines
    Airframe (Wings and Tail)
    Windscreen Heat
    Taxying on icy and/or slippery taxiways
  TAKE-OFF FROM CONTAMINATED RUNWAYS - PUDDLES 1-2-10
  TAKE-OFF FROM CONTAMINATED RUNWAYS - FLOODING 1-2-11
  TAKE-OFF FROM CONTAMINATED RUNWAYS - SLUSH OR SNOW 1-2-12

  AFTER TAKE-OFF 1-2-14
    Engines
    Airframe (Wings and Tail)
    Windscreen Heat

  CLIMB, CRUISE AND DESCENT 1-2-15
    Anticing During Descent
    One Air Supply System Inoperative
    Unheated Windscreen Limiting Speed

  APPROACH AND LANDING 1-2-16
    Ingestion/Flap Damage
    Snowbanks
    Landing Distances
    Engines
    Airframe (Wing and Tail)
    Fan intake shutters
    Very Slippery Runways

  AFTER LANDING 1-2-18

  GO-AROUND 1-2-18

  ANTICING AFTER ENGINE FAILURE 1-2-19
    Engines
    Airframe (Wing and Tail)

APPROVED AIRCRAFT DE-/ANTI-ICING FLUIDS 1-2-20

FLUID LIMITATIONS 1-2-21
Temperature limits

ANTI-ICING CODES 1-2-22

GROUND DE-ICING/ANTI-ICING HOLDOVER TIMES 1-2-23

DE-ICING OPERATIONS 1-2-24
Definitions

REMOTE DE/ANTI-ICING PROCEDURES 1-2-25

GENERAL PRECAUTIONS DURING DE/ANTI-ICING 1-2-27

VOLCANIC ASH 1-2-29

ADVERSE WEATHER OPERATION

TURBULENCE

Take-off

Do not take-off if severe turbulence is forecast or expected to be encountered before it may be possible to retract the flaps and accelerate to the rough air speed. If the flaps are still at the take-off setting and severe turbulence is met unexpectedly, they must be left extended: make every endeavour to achieve and hold the speed between 180 and 210 kts.

Climb, Cruise and Descent

Thunderstorms and areas of severe turbulence should be avoided. Use airborne weather Radar, ground Radar assistance and visual means to detect and avoid turbulence cells. Endeavour to avoid 'echoes' by a margin of 10 miles, but where the 'echoes' indicate a steep rainfall gradient, increase the margin to 15 miles at altitudes between 20,000 and 25,000 feet and to 20 miles at altitudes above 25,000 feet.

CAUTION - airborne weather Radar will not indicate echoes behind the nearest cells.

When penetration of such areas is unavoidable, prepare the aircraft in advance: use the speedbrakes to reduce speed to the rough air speed, and retract them when that speed is achieved. Adjust power appropriately and note the tailplane trim setting. Do not vary the power during the turbulence encounter. Stow all loose articles and fasten full harness. Ensure that the passengers and cabin crew are strapped in and that the cabin is secure.

Use of the autopilot is recommended as the best method of maintaining attitude during turbulence. Height lock and autothrottle must not be used. Make sure that the attitude is correct at the moment the height lock is disengaged as the autopilot will now control the aircraft to this attitude. The pitch control facility must not be used. Monitor the tailplane trim setting during the encounter and should it be necessary to disconnect the autopilot, ensure that the trim is returned to its original rough air speed setting. Monitor autopilot performance by use of the attitude director.

If turbulence is encountered unexpectedly, maintain the same speed provided it is within 10kt or 0.02M of the rough air speed. Do not disengage the height lock unless satisfied that the attitude is correct.

If it becomes necessary to take over manual control of the aircraft, aim to maintain normal attitude using moderate and smooth elevator movements. Do not attempt to chase airspeed or height. Do not change power or trim. Avoid turns; a straight course is likely to be the quickest way out, but if a manoeuvre is essential, make it gently.

Select engine and airframe anticing switches 'ON', except in clear air turbulence. Check operation of pitot heaters. Turn instrument lighting fully on to minimise the effect of lightning flashes. If negative 'g' is experienced, some transient warnings, eg low oil pressure, may occur.

Light to Moderate Turbulence

The autopilot may be used as normal; there is no limitation on the use of the height lock. However, be alert to the possibility of encountering severe turbulence. A change in flight level or a reduction in speed may provide more comfort.

Holding

If holding in severe turbulence maintain 280kt (400 series a/c 270kt) or 0.72M above 28700 ft. Below FL200 lower speeds (with an absolute minimum of 240kt at max landing weight and below) may be used, but 280kt (400 series a/c 270kt) is to be preferred.

Landing

If there are thunderstorms over or in the vicinity of the airfield, or reports indicate severe turbulence, consider holding or, if the storm is likely to be prolonged, diverting. Speed fluctuations of order 15kt may be expected.

WINDSHEAR

AVOID KNOWN WINDSHEAR

Severe windshear can compromise the performance margins on take-off and landing to the extent that unplanned ground contact becomes likely (and in extreme cases inevitable).

Any encounter with significant windshear should immediately be reported to ATC for the benefit of other aircraft.

Definition

Severe windshear may be defined as a rapid change in wind direction and/or velocity that results in airspeed changes greater than 15 knots or vertical speed changes greater than 500 feet per minute.

Flight Crew Strategy

Flight crew actions preparatory to encountering possible windshear events are divided into five areas. They are:

1. Evaluate the Weather.
2. Avoid Known Windshear.
3. Consider Precautions.
4. Follow Standard Operating Techniques.
5. Windshear Recovery Technique.

Evaluate the Weather

Detection of windshear is difficult with today's technology. Develop an awareness of the Causes and Danger Signals of windshear in order to successfully avoid it.

The most dangerous form of windshear is a convective weather microburst of either the dry or wet type.

AVOID KNOWN WINDSHEAR

Danger Signals & Detection

Pilot Reports	Caution - Due to the rapid intensification of microbursts, actual windshear may be up to twice as severe as the PIREP indicated.
Thunderstorms	In addition to the known hazards, an estimated 5% of thunderstorms which are accompanied by

	heavy rain and/or lightning also contain embedded microbursts.
Localised Strong Winds	Blowing dust, rings of dust, dust devils, other tornado-like features and other evidence of strong local outflow. (Caution - Visual clues may be obscured by low visibilities in wet thunderstorm microburst situations).
Turbulence	Moderate or severe turbulence may be associated with the outflow from a microburst.
Airborne Weather Radar	Search the area above and along the take-off and approach paths for heavy precipitation. Dry microbursts may not be detectable by Weather Radar.
Weather Forecast	Although no techniques currently exist to forecast wet microbursts, crews should consider thunderstorm forecasts contained in terminal forecasts and severe weather advisories as a possible indication of the presence of wet microbursts.

These danger signals are cumulative. Pilot reports of airspeed loss/gain of 20kt or more **OR** convective weather with heavy precipitation along the intended flight path **OR** convective weather with localised strong winds indicate a high risk of severe windshear. **AVOID, AVOID, AVOID!**

PRECAUTIONS TO CONSIDER

These precautions are recommended whenever the possibility of windshear exists but avoidance action is not considered necessary.

Take-Off

* Use full throttle thrust.
* Use the longest suitable runway, consistent with surface wind and away from areas of potential windshear.
* Monitor airspeed during the take-off roll and initial climb. When airborne, monitor IAS and vertical speed.

Approach

* Use all available means to detect the presence of windshear, including visual clues, pilot and ATC reports and flight instrument indications.
* Achieve a stabilised approach no later than 1000 ft agl.
* Avoid large power reductions or trim changes in response to sudden airspeed increases as these may be followed by

airspeed decreases.

- Use the longest suitable runway consistent with surface wind and away from areas of potential windshear.
- Use 26^0 flap if runway considerations permit. This flap setting provides a greater climb potential than 45^0 if windshear is encountered.
- Crew co-ordination and awareness is vital to ensure that flight path degradation will be recognised immediately. The non-handling pilot must call any deviation from normal. Monitor the radio height and vertical speed in particular.

In most cases, windshear of the severity discussed above will have associated with it a degree of turbulence such that the 1-11 autopilot will either be disconnected manually or will auto-disconnect. Bear in mind that in some met situations and at certain airfields, eg coastal with little or no turbulence inducing terrain, windshear can exist with little turbulence. With no access to ground speed information it would be prudent to assume that noticeably unusual power requirements on approach indicate the presence of windshear and the auto-pilot should be disengaged. Serious consideration should be given to an early precautionary go-around.

WINDSHEAR RECOVERY TECHNIQUES

The following actions are recommended whenever flight path control becomes marginal below 1000 ft agl on take-off or approach. As guidelines, marginal flight path control may be indicated by deviations from target conditions in excess of:-

- ± 15 kt IAS
- ± 500 fpm
- ± 5^0 pitch attitude
- ± 1 dot displacement from the glideslope
- Abnormal autothrottle activity/position

NOTE - These deviations may be accompanied by GPWS.

SEE EMERGENCY PROCEDURES 2-11-21 - WINDSHEAR GO-AROUND

If flight path control becomes marginal at low altitudes, windshear recovery procedures must be initiated immediately. Accomplish the first four steps simultaneously:-

1. **Autopilot/autothrottle** - Disconnect.
2. **Power** - Disengage the autothrottles and aggresively apply full power to ensure adequate aircraft performance.

3. **Call "Windshear Go-around"** - This call alerts the other crew members that instant windshear recovery action is required and that the aircraft may have to be flown at speeds and attitudes outside the range of normal operations.

4. **Pitch** - For a windshear encounter after take-off or on approach, adjust the pitch attitude as necessary (at the normal pitch rate) towards an initial target attitude of 15^0. Always respect the stick shaker. Use intermittent stick shakes as the upper limit for pitch. Rapidly changing vertical winds can also cause momentary stick shakes at any attitude. If attitude has been limited to less than 15^0 to stop stick shakes, increase attitude towards 15^0 as soon as stick shake stops.

   If the vertical flight path or altitude loss is still unacceptable after reaching 15^0, further increase the pitch attitude smoothly in small increments.

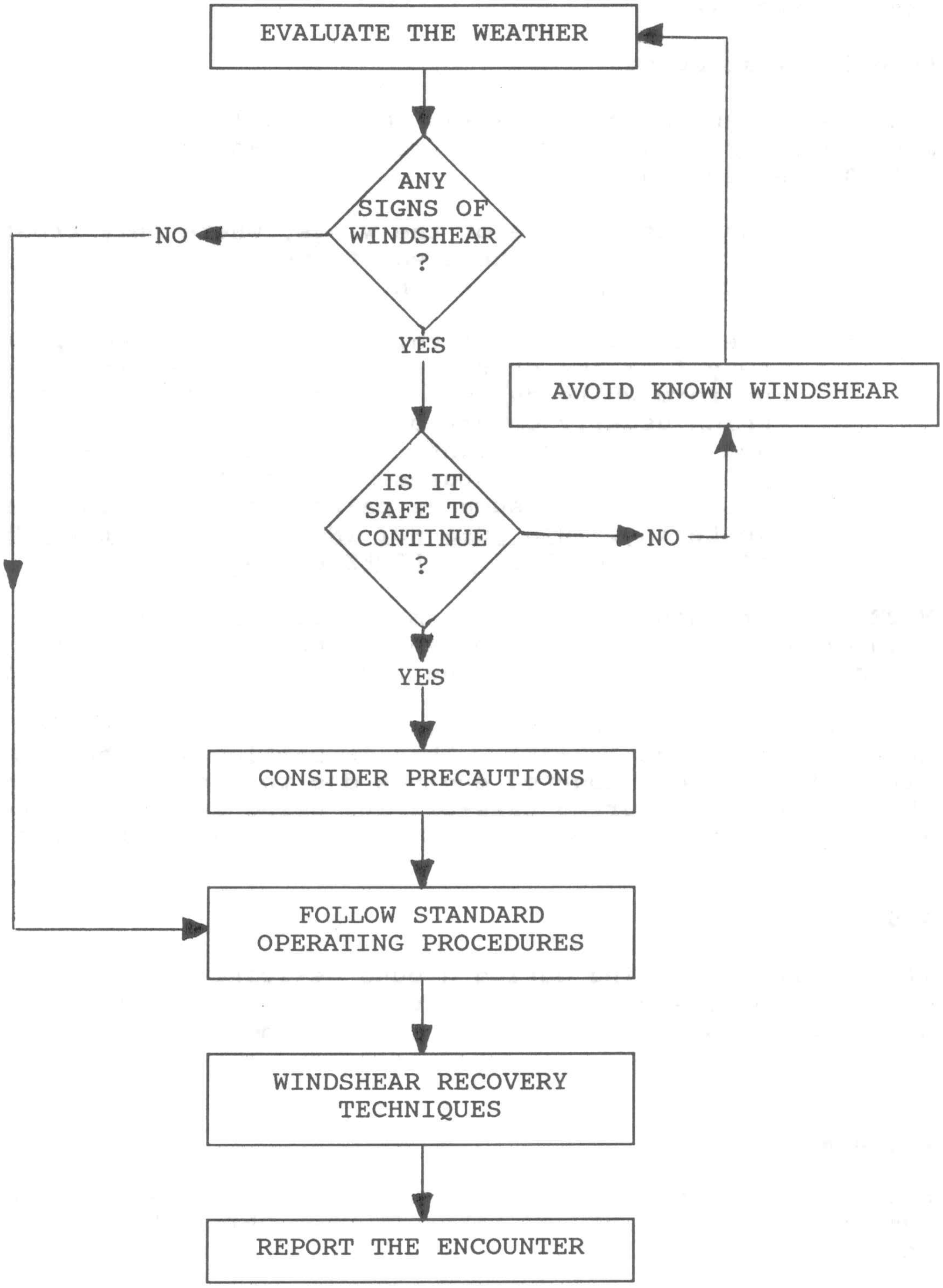
   Rapidly changing winds may cause rapid excursions in pitch and roll with little or no pilot input. Control pitch in a smooth, steady manner (in approximately 2^0 increments) to avoid excessive overshoot/undershoot of the desired attitude. Once the aircraft is climbing and ground contact is no longer an immediate concern, airspeed should be increased by cautious reductions in pitch attitude.

5. **Configuration** - Do not change flap, gear or trim position until terrain contact is no longer a factor.

REPORT THE ENCOUNTER

Report the airspeed change, shear location and altitude and the aircraft type to ATC as quickly as possible. Use the term **"PIREP"** in making the report in order to encourage rebroadcast to other aircraft.

SUMMARY


EVALUATE THE WEATHER
ANY SIGNS OF WINDSHEAR ?
NO
YES
AVOID KNOWN WINDSHEAR
IS IT SAFE TO CONTINUE ?
NO
YES
CONSIDER PRECAUTIONS
FOLLOW STANDARD OPERATING PROCEDURES
WINDSHEAR RECOVERY TECHNIQUES
REPORT THE ENCOUNTER

ICE AND RAIN

BEFORE TAKE-OFF

Exterior Inspection

With the exception of the areas defined below, the aircraft must be clear of all forms of frost, ice and snow before take-off. The exceptions are:-

1. The undersurface of the wings, where only frost is permissible in the area of the fuel tanks to a maximum depth of 1/8 in.

2. The fuselage, where thin hoar frost is acceptable away from the static vents. Thin hoar frost is a uniform white deposit of fine crystalline texture, which usually occurs on exposed surfaces on a cold and cloudless night, and which is thin enough to permit surface features beneath it to be distinguished, such as paint lines, markings or lettering. THIS DOES NOT INCLUDE RIME ICE FORMED ON WINDWARD SURFACES IN FREEZING FOG.

NOTE - Ice ridges that have formed underwing, due either to rain or melting frost, ice or snow running back and re-freezing in the vicinity of the fuel tanks are not acceptable.

Be especially alert to the formation of clear ice on the wing upper surface (see 1-2-27). This is particularly hazardous to aircraft with rear mounted engines due to the possibility of the ice shedding during take-off and being ingested. Such ice may be difficult to detect at night, especially on a wet wing.

APU

If the APU is running during ground de-icing, close the air conditioning master valves and the APU air delivery valve to avoid the possibility of toxic fumes being drawn into the cabin.

Engines

Engine antice must be switched ON after engine start and remain ON for taxying and take-off when OAT is below +10°C and:-

1. Visibility is below 1000 m,
or 2. Runway is wet,
or 3. Icing conditions are present.

Additionally, when OAT is below +1°C the engines should be run at 90% (11000) HP rpm for 5 seconds, at intervals of not more than 8 minutes during taxying, before take-off.

Start/Relight switches must be set to 'Relight' before take-off power is applied:-

1. When the runway is wet (at any OAT),
or 2. When there is snow or slush on the runway
or 3. When there is precipitation (at any OAT).

They must be set to 'Off' in accordance with the After Take-off Check.

Airframe (Wings and Tail)

A ground test is required during full checks. Select each wing and tail antice switch to Test in turn, check that the air system pressure drops, or, where fitted, the airframe antice dolls eye indicates ON. An Antice switch should not be held to Test for more than 10 seconds. Confirm that air system pressure is restored, or dolls eye indicates OFF, after switch is released.

Wing and tail anticing must be Off during taxying and take-off.

Windscreen Heat

Heating switch must be at 'High', on the ground:-

1. In icing conditions,
or 2. If OAT is -15°C or below,
or 3. If the underheat warning lamps are on with the switch at Low (or for S1-11, Normal).

Taxying on icy and/or slippery taxiways

If wheel braking is ineffective, and the safety of the aircraft is hazarded, select Reverse Idle. Only if this is ineffective should Reverse Thrust be used as necessary to bring the aircraft to a halt.

TAKE-OFF FROM CONTAMINATED RUNWAYS - PUDDLES

Observe the limitations and procedures described below.

1. PUDDLES Less than 12mm deep and 6m (20 ft) long on the intended take-off run may be treated as normal wet runway.

    1. Use Standard Thrust
    2. Use wet V_1.
    3. Select engine anticing On if OAT below +10°C.
    4. Select relight switches On.

2. PUDDLES 12mm to 20mm deep or exceeding 6m (20ft) long on the intended take-off run - **Take-off at Captain's discretion.**

    CAUTION - Consider particularly the number and position on the runway in relation to the intended take-off run; the consequences of encountering pools of excessive depth can be particularly serious when this occurs during the later stages of the take-off run.

    1. Lift dump must be serviceable.
    2. Wheelbrake system must be fully serviceable.
    3. Both thrust reversers must be serviceable.
    4. Select fan intake shutter Shut (if fitted).
    5. Select standard thrust.
    6. Use wet V_1.
    7. Select engine anticing On if OAT below +10°C.
    8. Select relight switches On.
    9. Do not make a rolling start.

3. PUDDLES More than 20mm deep of any length on the intended take-off run - **DO NOT TAKE-OFF.** There is a risk of engine malfunction due to water ingestion.

TAKE-OFF FROM CONTAMINATED RUNWAYS - UNIFORM FLOODING

Observe the limitations and procedures described below.

1. UNIFORM FLOODING, less than 3mm deep may be treated as normal wet runway.
    1. Use Standard Thrust
    2. Use wet V_1.
    3. Max crosswind 12kt
    4. Select engine anticing On if OAT below +10°C.
    5. Select relight switches On.

2. UNIFORM FLOODING, 3mm to 12mm deep (see NOTE). **Take-off at Captain's discretion provided OAT does not exceed ISA.**

    NOTE - This condition is extremely unlikely as a result of rain alone, unless a cross-wind is preventing adequate drainage of torrential rain.

    1. Lift dump must be serviceable.
    2. Wheelbrake system must be fully serviceable.
    3. Both thrust reversers must be serviceable.
    4. Use Special Tables 'TOW on Contaminated Runways' in Performance Manual.
    5. Use 'Bleeds off' take-off technique.
    6. Fuel tankering is not permitted.
    7. Max crosswind 12kt.
    8. Maximum runway distance available must be used.
    9. Do not take-off with a tailwind component.
    10. Select fan intake shutter Shut (if fitted).
    11. Select full throttle thrust (with standard thrust index set).
    12. $V_1 = V_R - 5$.
    13. A rather firmer pull than normal may be required for rotation and particular care should be taken not to over-rotate. Note that in an emergency the aircraft can achieve lift off at speeds as low as V_R-5.
    14. Select engine anticing On if OAT below +10°C.
    15. Use flaps 18° (NLE 13° or 20°).
    16. Select relight switches On.
    17. Do not make a rolling start.
    18. The nature of the overrun area, the potential consequences of the overrun and possible weather changes since the last measurement or report, must also be considered.

3. UNIFORM FLOODING, 3mm to 12mm and OAT more than ISA.
    or
    more than 12mm at any OAT.

    DO NOT TAKE OFF - Snow and Slush TOW's are invalid above +18°C and there is a risk of engine malfunction when more than 12mm of uniform flooding exists.

TAKE-OFF FROM CONTAMINATED RUNWAYS - SLUSH OR SNOW

Runways which have been previously deiced may become contaminated with slush at low temperatures when the remainder of the aerodrome is covered in dry snow. If there is any doubt about the condition of the snow on the runway, it must be treated as slush, especially when the OAT is above -5°C. A mixture of snow and slush must be treated as slush.

As a guide, half an hour of moderate snowfall would add less than 3mm of slush. (Extremely Dry Snow is defined as having a specific gravity of less than 0.2.)

If taxying during heavy snow/sleet for long periods, delay extension of take-off flap until nearing the runway. This reduces the possibility of snow/slush accumulation and refreezing in flap slots and mechanisms. Ice build up of this kind could interfere with handling or flap retraction after take-off.

However, do NOT proceed past the flap check in the "before take-off" checklist until the flap selection has been made.

Observe the limitations and procedures described below:-

1. Runway clearance. The minimum acceptable cleared width for take-off is 30m (100ft). Therefore the performance must be calculated for the greatest depth of deposit within the 30m.

2. Snowbanks:
   a. If the cleared width is less than 36m (120ft), the snowbanks must not exceed 50cm (19 inches) height.
   b. If the cleared width is 36m (120ft) or greater, the snowbanks should not exceed 90cm (36 inches).
   c. If the full width is cleared, snowbanks should not greatly exceed 90cm (36 inches).

3. Visual guidance for take-off must be available from centre-line lighting or centre-line paint markings or runway edge lighting or runway edge markers/markings.

4. Rotation may require a rather more firm backward pressure than normal, but care should be taken not to over-rotate. In an emergency the aircraft can be lifted off a speed as low as V_R -5.

Continued....

5. Systems and Procedures:

SLUSH Less than 3mm deep or EXTREMELY DRY SNOW Less than 12mm deep

No significant effect on performance

1. Lift dump must be serviceable.
2. Wheelbrake system must be fully serviceable.
3. Both thrust reversers must be serviceable.
4. Max crosswind limit 12kt; if cleared width less than 36m, 6kt.
5. Select fan intake shutter Shut (if fitted).
6. Select Standard Thrust.
7. Use wet V_1.
8. Select engine anticing On.
9. Select relight switches On.
10. Do not make a rolling start.

SLUSH 3mm to 12mm deep or EXTREMELY DRY SNOW 12mm to 40mm deep

1. Lift dump must be serviceable.
2. Wheelbrake system must be fully serviceable.
3. Both thrust reversers must be serviceable.
4. Use Special Tables 'TOW on Contaminated Runways' in Performance Manual.
5. Use 'Bleeds off' take-off technique.
6. Fuel tankering is not permitted.
7. Max crosswind 12kt, 6kt if cleared width is less than 36 metres.
8. The maximum runway distance available must be used.
9. Do not take-off with a tailwind component.
10. Select fan intake shutter Shut.
11. Select full throttle thrust (with standard thrust index set).
12. $V_1 = V_R - 5$.
13. Select engine anticing On.
14. Use flaps 18° (NLE 13° or 20°).
15. Select relight switches On.
16. Do not make a rolling start.
17. The nature of the overrun area, the potential consequences of an overrun and weather changes since the last measurement or report, must also be considered.

EXTREMELY DRY SNOW 41mm to 50mm deep

As for dry snow 12mm to 40mm deep EXCEPT use additional weight restriction in 'Snow and Slush and Standing Water - Limitations' in Performance Manual.

SLUSH More than 12mm deep or EXTREMELY DRY SNOW More than 50mm deep

DO NOT TAKE-OFF.

AFTER TAKE-OFF

Engines

Engine anticing must be switched On, if not already On:-

1. Immediately ice warning lamp illuminates
2. If any other indication of icing is observed.

NOTE - If an engine is shut down while the ice warning lamp is 'ON', that engine's anticing must not be switched 'OFF' until clear of icing, otherwise the warning lamp will not go out when icing conditions have cleared.

Airframe (Wings and Tail)

In known icing conditions, or after receipt of an ice warning after take-off, the Wing and Tail anticing must be switched on, in that order, at 1500ft QFE.

NOTE - Prior to selecting airframe anticing on, ensure that air conditioning has been selected from APU to engine air.

Windscreen Heat

Heating switch must be at high, in flight:-

1. If IOAT is -5°C or below

or 2. If the underheat warning lamps illuminate.

CLIMB, CRUISE AND DESCENT

Engine, Wing and Tail anticing must be switched on, in that order:-

1. Immediately ice warning lamp illuminates
2. If any other indication of icing is observed.

When icing conditions have ceased and the ice warning lamp has gone out, switch off Tail, Wing and Engine anticing, in that order.

Anticing During Descent

With wing and tail anticing On, the minimum necessary rpm is 74% HP rpm (S1-11 9300 HP rpm) (400 series a/c 72% HP rpm); at this setting adequate anticing will be maintained, but cabin ventilation and ROD may be reduced and should be closely monitored.

One Air Supply System Inoperative

The minimum mains pressure for adequate ventilation is 38psi.

Unheated Windscreen Limiting Speed

Do not exceed 190kt below 8000ft QNH (below FL100 when increased risk of bird strike is suspected). In turbulence use the recommended rough air speed.

APPROACH AND LANDING

Engines

When the OAT is below +10°C, engine anticing must be On for approach and landing if:-

1. Visibility is less than 1000 metres,

or 2. The runway is wet,

or 3. Icing conditions are present.

Relights must be selected On prior to touchdown and switched Off after landing:-

1. When the runway is wet (at any OAT),

or 2. When there is snow or slush on the runway,

or 3. When there is precipitation (at any OAT).

Windscreen Heat

The windscreen heat must remain at High for landing if the IOAT remains below -5°C during the approach, or the approach is carried out in icing conditions. It is permissable to leave the switch at High at temperatures up to +10°C. However, select Low/Normal after landing.

Airframe (Wing and Tail)

Wing and tail anticing should be switched Off at 1500ft QFE.

Fan intake shutters

Before landing on a contaminated runway the cooling fan intake shutters (if fitted) should be selected shut.

Ingestion/Flap Damage

Unless diversion to a more suitable airfield is impracticable, do not land on a runway where there is standing water or slush in excess of about 15 mm depth, or snow in excess of about 50 mm depth.

Cleared Width

Minimum acceptable cleared width is 30m (100ft).

Snowbanks

1. If the cleared width is less than 36m (120ft), the snowbanks must not exceed 50cm (19 inches) height.
2. If the cleared width is 36m (120ft) or greater, the

snowbanks should not exceed 90cm (36 inches).

3. If the full width is cleared, snowbanks should not greatly exceed 90cm (36 inches).

Landing Distances

When braking action is reported poor, or if the runway surface is extremely slippery (runway classified 'slippery when wet', heavy rain falling, 'flooded', wet ice, or slush) the increase in landing distance at max landing weight, after reducing to V_{AT} at the threshold and using Emergency Reverse thrust until the aircraft has stopped, can be up to 400m.

If "WATER PATCHES" are present on the runway, the Captain should use his discretion in assessing the required increase in landing distance. Consider the use of Emergency Reverse.

The Slippery Runway Maximum Weights given in the Performance Manual assume normal landing speeds and a friction coefficient of 0.05 along the entire landing run, giving braking action poor or less. Such surface conditions are encountered infrequently and rarely apply to the whole runway.
Note that the Slippery Runway Maximum Weights assume that:-

1. Reverse thrust is available on both engines.
2. There is no deficiency in the braking system.
3. Spoilers and lift dump are available.
4. Use of 45^0 flap.

Very Slippery Runways

Consideration should be given to carrying out a VAT landing - see Flight Handling 1-1-34.

Place the aircraft firmly on the runway, lower the nosewheels as soon as possible, and delay initial wheel braking slightly to allow the wheels to spin up and to allow full control of aircraft heading and track to be established. Select Reverse thrust as soon as possible and maintain until a safe stop is ensured. With adverse conditions it may be necessary to use and maintain Emergency Reverse thrust until the aircraft has stopped.

Braking technique affects the stopping distance. Maximum braking effort is obtained when sufficient steady brake pressure is applied to bring the anti-skid system into operation.

On wet or icy surfaces, avoid over hasty braking and give preference to keeping the aircraft straight. On a wet runway a 5 second delay in applying wheel brakes extends the stopping distance by less than 50m, whereas misjudged correction of drift could lead to a need for heavy asymmetric braking and a consequent risk of loosing tyre adhesion.

If the aircraft tends to slide/drift towards the side of the runway and weathercock, select reverse idle immediately and forward idle if directional control is not regained; if the drift continues, provided sufficient runway length remains, the Captain may at his discretion apply forward thrust to bring the aircraft back toward the runway centreline. When the aircraft is safely returning toward the centreline, reverse thrust may be re-applied.

If it appears that the aircraft will not stop before the end of the runway, use emergency reverse thrust. DO NOT ATTEMPT TO RETRACT THE GEAR.

If, with relight selected, engine HP rpm falls below 44% (5500), do not open the throttle but immediately close the HP cock.

AFTER LANDING

If the runway surface is contaminated with grit, snow, slush, or standing water, the flaps must not be raised beyond 18° (NLE 20); after shutdown, flaps and engines must be inspected and cleansed as required.

If wheel braking becomes ineffective during taxying, and the safety of the aircraft is threatened, select reverse idle; only if this is ineffective should reverse thrust be used to stop the aircraft.

GO-AROUND

In icing conditions engine anticing may be left on for go-arounds. Switch off relights passing 1500ft QFE. Airframe anticing, wings and tail, should be switched on at 1500ft QFE.

ANTICING AFTER ENGINE FAILURE

Engines

Engine anticing for both engines should remain 'On' or be selected 'On' as for normal flight.

Airframe (Wing and Tail)

Only the wing and tail switches of the operative engine should be selected or remain 'ON'. The failed engine's airframe switches should be selected 'OFF'. Maintain 38psi mains pressure for adequate anticing protection.

After an engine failure on take-off airframe anticing will not be switched on until at 1500ft (following the 'air-changeover').

On the approach the airframe anticing will be switched 'OFF' at 1500ft QFE.

On the go-around, the airframe anticing will be switched 'ON' at 1500ft QFE (following the 'air-changeover').

APPROVED AIRCRAFT DE-/ANTI-ICING FLUIDS

There are two main types of de-/anti-icing fluid:

AEA Type 1 fluids (unthickened). These fluids have a high glycol content (minimum 80%) and a low viscosity. The de-icing performance is good, however, they provide only limited protection against re-freezing.

AEA Type 11 fluids (thickened). These fluids have a minimum glycol content of 50% and due to the thickening agent present, special properties which enable the fluid to remain on the aircraft surfaces until take-off. The de-icing property is good and in addition, protection is provided against re-freezing and/or build up of further accumulations, when exposed to freezing precipitation.

The following fluids are approved for use on British Airways aircraft, provided that they are used in accordance with the manufacturers instructions. The expected holdover times can be established by relating the fluid type rating, detailed in the following list, to the relevant temperature band/weather condition listed in the 'Guideline to Holdover Times' chart.

	Proprietary Name	Fluid Type	Manufacturer
a)	Kilfrost ABC-3	2	Kilfrost
b)	Hoechst 1704 LTV 88	2	Hoechst
c)	Flightgard 2000	2	Dow Chemical
d)	SPCA AD 104	2	
e)	UCAR ADF 11	1	Union Carbide
f)	Kilfrost DF	1	Kilfrost
g)	De-icing Fluid C or D	1	Union Carbide
h)	Flightgard 146 AR	1	Dow Chemical
i)	Flightgard 1010	1	Dow Chemical
j)	BASF Aerex	1	BASF
k)	De-icing Fluid 'P'	1	Dow Chemical
l)	Any other available fluid conforming to Specification MIL-A-8243. Such fluids should be considered as being AEA Type I fluids regarding holdover times.		

In addition to the AEA types I and II fluids outlined above, ATP 688 part 2 Ground Handling Booklet "Operations in Snow and Ice Conditions" details the use of other approved Type I fluids used at a small number of specific airports. Routine use of the fluids detailed below is restricted to the following airports:-

Airport	Handling Agent	Fluid Type	Propriety Name
Helsinki	Nurminen Air	1	Shell 80/20
Paris	Aeroports de Paris	1	NAPGEL
Prague	CSA	1	OK 69
Sofia	Balkan Airways	1	ARKTIKA
Warsaw	LOT	1	WT-G

Kilfrost R328 and RDF have also been cleared for removing light deposits of frost and ice from underwing area. When applied cold and neat this fluid is reasonably effective in removing these deposits but only gives minimum protection against re-freezing.

On those occasions when other approved fluids are not available they may be used, in an emergency, for cold 'general' de-icing. Due to the minimal protection offered against re-freezing, however, under certain conditions, eg freezing precipitation, a visual check will be required immediately prior to take-off.

CAUTION - KILFROST R328 AND RDF ARE INFLAMMABLE, ENGINES MUST NOT BE RUNNING AND APU MUST BE SHUT DOWN IF SPRAYING OTHER THAN THE UNDERSURFACES OF THE WINGS. BEFORE RE-STARTING THE APU ENSURE THAT ANY RESIDUAL DE-ICING FLUID IS REMOVED FROM THE VICINITY, PARTICULARLY THE INLET AND EXHAUST AREAS.

FLUID LIMITATIONS

Temperature limits

1. AEA Type I Fluids - The freezing point of the AEA Type I fluid mixture used for either one step de/anti-icing or as a second step in a two-step operation MUST BE at least 10°C below the ambient temperature.

   The freezing point of the AEA Type I fluid mixture used for the first step in a two-step operation shall not be more than 7°C above the ambient temperature.

2. AEA Type II Fluids - The approved mixture strengths of AEA type II fluids, used either for one-step de/anti-icing or as a second step in a two-step operation are listed below, together with details of the minimum temperatures at which the various concentrations may be applied to aircraft surfaces:-

Mixture Strength (glycol/water)	Lower Temperature Limit for Application
50/50	- 7°C
60/40	-10°C
75/25	-14°C
100/0	-25°C

   The lower temperature limits for the AEA Type II fluid mixes/hot water used for the first step in a two-step operation are as follows:-

Mixture Strength (glycol/water)	Lower Temperature Limit for application
0/100	- 7°C
50/50	-17°C
75/25	-25°C

CAUTION - WHEN A TWO-STEP OPERATION IS TO BE CARRIED OUT, THE SECOND STEP **MUST** BE PERFORMED WITHIN 3 MINUTES OF THE BEGINNING OF STEP ONE, IF NECESSARY AREA BY AREA.

On those rare occasions where there is a requirement to de-ice with AEA Type II fluids at an ambient temperature below -14°C and a two-step operation cannot be performed, **PROVIDED NO OTHER SUITABLE MEANS IS AVAILABLE** neat fluid may be heated to a maximum of 85°C and used for de-icing at temperatures down to -25°C.

Any aircraft that has been de-iced can, if required, be immediately anti-iced in order to obtain benefit from the additional holdover times generated.

ANTI-ICING CODES

When an aircraft is de-iced an automatic anti-icing capability is 'built-in' to the process. The results of the de-icing operation are therefore that all frost, ice and snow is removed and then there is a certain period of time during which there is protection against further accretion, i.e. holdover time.

In order that the likely holdover can be determined, a number of simple Anti-icing codes have been devised. These codes describe the quality of the treatment the aircraft has received and will be entered in the Tech Log, together with the time of the application. At LHR this information will be entered into FICO by GOL staff and no Tech Log entry will be made.

When an aircraft is de-iced or anti-iced with an AEA Type 1 fluid the code will be:

Anti-icing AEA Type 1

This code leads to the holdover times listed under the AEA Type 1 fluid column in the 'Guidelines to Holdover Times' table.

When an aircraft is de-iced or anti-iced with an AEA Type 11 fluid the code is dependent on the mixture strength of the fluid. The percentage of de-icing fluid is always reported first, followed by the percentage of water, i.e. 75/25 is a mixture of 75% de-icer and 25% water. The following codes lead to the holdover times listed under the AEA Type 11 fluid column in the 'Guidelines to Holdover Times' table.

a) Anti-icing AEA Type 11/100 - for 100% AEA type 11
b) Anti-icing AEA Type 11/75 - for 75% AEA type 11
c) Anti-icing AEA Type 11/60 - for 60% AEA type 11
d) Anti-icing AEA Type 11/50 - for 50% AEA type 11

NOTE - When a 2-step de-icing operation has been carried out, the anti-icing code will be determined from the second step fluid.

GROUND DE-ICING/ANTI-ICING HOLDOVER TIMES

The following table gives an indication as to the degree of protection that could reasonably be expected under conditions of average precipitation. However, due to the many variables that can influence holdover, these times should not be considered as being definitive as the actual period of protection may be extended or reduced, depending on the actual conditions existing at the time.

Therefore, flying surfaces must be checked immediately before departure in order to confirm that they are free of all forms of frost, ice and snow.

When severe conditions are experienced, or the published holdover times either have been or are about to be exceeded, a further visual check of the wings should be made just prior to take-off in order to confirm that they are free of all forms of frost, ice and snow. Only when such deposits are in evidence will it be necessary to repeat the de-icing operation.

GUIDELINE TO HOLDOVER TIMES

AMBIENT TEMPERATURE °C	WEATHER CONDITIONS					AEA TYPE 11 FLUIDS				AEA TYPE 1 FLUIDS (SEE NOTE 2)
	FROST	FREEZING FOG	Steady Snow	FREEZING RAIN	RAIN ON COLD SOAKED WING	ANTI-ICING	DE-ICING			
						100%	75/25 (Hot)	60/40 (Hot)	50/50 (Hot)	
ABOVE O	*	*	*	*	*	8 HRS 3 HRS 1 HR 20 MINS	5 HRS 2 HRS 3/4 HR 10 MINS	4 HRS 1 3/4 HRS 35 MINS 7 MINS	3 HRS 1 ½ HRS ½ HR 5 MINS	3/4 HR ½ HR 1/4 HR 5 MINS
0 TO -7	*	*	*	*		8 HRS 1 ½ HRS 3/4 HR 20 MINS	5 HRS 1 HR ½ HR 10 MINS	4 HRS 50 MINS 20 MINS 5 MINS	3 HRS 3/4 HRS 1/4 HR 3 MINS	3/4 HR 1/4 HR 1/4 HR 3 MINS
-8 TO -10	*	*	*			8 HRS 1½ HRS 3/4 HR	5 HRS 1 HR ½ HR	4 HRS 50 MINS 20 MINS		½ HRS 1/4 HR 1/4 HR
-11 TO -14	*	*	*			8 HRS 1½ HRS 3/4 HR	5 HRS 1 HR ½ HR			½ HRS 1/4 HR 1/4 HR
-15 TO -25	*	*	*			8 HRS 1½ HRS 3/4 HR				½ HRS 1/4 HR 1/4 HR

NOTE 1: No significant increase in holdover time is achieved by strengthening the mix of AEA type I fluids.
NOTE 2: The protection period will be reduced if the fuel temperature is significantly less than OAT (i.e. 10°C or more).
NOTE 3: High wind velocity (AEA type I fluids only) and jet blast may cause degradation of the protective film. Under these conditions the protection period may be shortened considerably.

DE-ICING OPERATIONS

Ground staff are responsible for ensuring that aircraft have been de-iced in accordance with the procedures detailed in ATP 688/2 'Operations in Snow and Ice Conditions' and the 1-11 maintenance manual. The following information is provided to enable the flight crew to monitor the pre-departure operations.

Definitions

De-icing - the procedure by which frost, ice or snow is removed from the aircraft surfaces. To maximise holdover time the process should be continuous and as short as possible. Preferably, the de-icing agent should be applied in a hot state to ensure maximum efficiency.

One-Step De-icing - is carried out with a mixture of fluid/water depending on the ambient temperature. The process includes a 'built-in' anti-icing treatment which is dependent on the type of fluid used and, in the case of type 11 fluid, the mixture strength.

Two-Step De-icing - The first step, de-icing, is carried out using hot water or a hot mixture of fluid/water depending on the ambient temperature. The second step, anti-icing, is an overspray with 100% (neat) fluid or a hot mixture of fluid/water depending on the ambient temperature and weather conditions. The second step must be carried out within 3 minutes of beginning step 1, if necessary area by area.

Anti-icing - is a precautionary measure which prevents frost, ice or snow from forming or accumulating on the treated surfaces of the aircraft.

NOTES

1. Under no circumstances may an aircraft which has been anti-iced receive a further coating of neat fluid on top of an existing film. Should it be necessary for the aircraft to be protected prior to the next flight, then the external surfaces must first be de-iced with a hot mix, before a further application of anti-icing fluid is made.

2. Whenever de-icing fluid is applied, including the case where partial de-icing is carried out, both wings and both left and right sides of the tailplane must receive the same treatment. Fluid must always be applied symmetrically, even if there are no deposits of snow/frost or ice in some areas.

REMOTE DE/ANTI-ICING PROCEDURES

Introduction

At those airports where approval has been granted, aircraft may be de/anti-iced at a remote stand or area, which will normally be positioned between the terminal building and the runway.

The main reason for remote de/anti-icing is environmental. The run-off may be more easily collected and prevented from entering the ground water.

Procedure

A BA authorised Engineer must always be in charge of the operation and will be responsible for ensuring that the aircraft is properly de/anti-iced.

The published de/anti-icing procedures must be actioned in full.

Pre-departure checks will be completed, except de/anti-icing and the Tech Log must be endorsed **'less de-icing'**.

The aircraft will then taxy to the de/anti-icing area, where all air supplies to cabin and flight deck will be selected OFF.

If the main engines are kept running, they must be maintained at 'idle' throughout the de/anti-icing operation.

During the operation, all reasonable precautions will be taken to ensure that de/anti-icing fluid does not enter the engines.

Where AEA Type II fluid is used for de/anti-icing, the following standard requirements must be met:-

1. Any forward area from which fluid may blow back onto windscreens during taxy/take-off must be free of fluid residues prior to departure.
2. Any trace of de/anti-icing fluid on flight deck windows must be removed prior to departure, particular attention being paid to windows fitted with wipers. Fluid may be removed by rinsing with water, or WWF and a soft cloth. Do not use the windscreen wipers for this purpose.

On completion of de/anti-icing, the Engineer in charge will ensure that all frozen deposits have been removed and that the aircraft is ready for take-off.

The Engineer will establish communication with the flight deck and the Captain informed of the appropriate anti-icing code and treatment application times.

The Engineer in charge will maintain a journal containing an individual certification by him for each aircraft treated. He will complete this prior to each aircraft leaving the de/anti-icing area detailing:-

1. Aircraft registration
2. Anti-icing code
3. Treatment application times
4. Date

This certification will also indicate that the correct materials and procedures have been used during the operation.

In the event of a delayed take-off or other special circumstances which might affect the de/anti-icing clearance, it will remain the Captain's responsibility to call for such further protection as he considers necessary.

Paris CDG

The deicing procedures at CDG are slightly different to the above and are set out in the aerodrome booklet. However, the Tech Log and de/anti-ice recording procedures are as above.

GENERAL PRECAUTIONS DURING DE/ANTI-ICING

1. Engines and APU may be running during de/anti-icing but the airconditioning and APU air must be selected off.

2. All reasonable precautions must be taken to minimise fluid entry into engines, other intakes/outlets and control surface cavities.

3. Both wings and stabilisers must receive the same and complete treatment.

4. De/anti-icing fluids must not be sprayed directly into the orifices of probes or vents or onto sensors, drains, windows or hot brakes/wheels.

5. Any traces of de/anti-icing fluids must be removed from the flight deck windows, and particularly from the wipers. In addition the nose cone area, from which fluid may blow back onto windscreens during taxi and take-off, must be free of fluid.

6. Clear ice can form on the aircraft's surfaces below a layer of snow or slush. It is important to inspect surfaces following each de-icing to ensure that all deposits have been removed.

7. When an aircraft has been exposed to an extended period of snow, freezing rain or other conditions which could restrict flight control movement, a flight control check must be performed.

8. Before removing ice or snow from the tailplane set the TPI to fully nose down (i.e. the tailplane leading edge fully up). This will enable residues to run back off the tailplane rather than to run forward from the trailing edge areas into cavities where they could subsequently re-freeze.

9. Significant deposits of clear ice can form in the vicinity of the fuel tanks on the upper surface of the wing in addition to the under surface. Aircraft are most vulnerable to this type of build-up when:

    1. Wing temperatures remain well below zero during a turnround.
    2. Ambient temperatures are between -2° and 10°C.
    3. Precipitation occurs while the aircraft is on the ground.

   This type of ice is extremely difficult to detect and so in these conditions a close inspection of the upper wing surface must be made using suitable means of access. Should de-icing be required a further close inspection must be made immediately prior to departure, in order to ensure that all frozen deposits have been removed.

NOTE - The low wing temperatures associated with this sort of formation usually occur when large quantities of supercooled fuel remain in the tanks during turnround and any fuel uplift is insufficient to cause an increase in the fuel temperature.

10. Ice can build up on control surfaces when descending through thick cloud or precipitation during approach or when landing on a snow/slush covered runway. When ground temperatures are low, it is possible for accumulations of ice to remain undetected between flap surfaces after retraction. It is important that these areas are checked and to facilitate inspection on stand, consideration should be given to setting the flaps to the take-off position after landing.

11. In freezing fog conditions it is necessary to inspect the rear side of the fan blades for ice prior to engine start. Any deposits discovered can be removed by directing air from a low flow hot air source, such as a cabin heater, on to the affected area.

FICO

FICO contains a number of useful lists of data which are pertinent to winter operations. The codes for these are listed below:

BADWX
All airfields with adverse weather.
For airfields with adverse weather in Britain only enter BADWX BRIT, Germany BADWX GERM etc.

SNOWX
Airfields with SNOWTAMS

SIGWX
Summary of stations with SIGMET

ICE VMI
Available for aircraft at LHR and LGW only. De-icing state of aircraft G-AVMI including the start and finish times of the operation, the type and strength of fluid mix (see ANTI-ICING CODES page 1-2-22) and the type of operation:
F = Full de-ice O = Overwing and tail only
U = Underwing only T = Tail only
Type 2 fluid is used for all de-icing operations at LHR and LGW except for underwing defrosting, when type 1 is sometimes used.

VOLCANIC ASH

Flight in areas of volcanic activity must be avoided. This is particularly important during hours of darkness or daytime IMC when volcanic dust may not be visible. When a flight is planned into an area with a known potential for volcanic activity, it is recommended that all NOTAMS etc be inspected for the current status of volcanic activity. If volcanic activity is reported, the flight must be planned to remain well clear of the area and if possible keep to the upwind side of any dust fallout.

In Flight

Airborne weather Radar is not designed to detect volcanic dust, hence volcanic dust is difficult to detect at night or during flight in cloud. If an area of volcanic dust is inadvertently entered, the following may be observed:-

1. Smoke or dust appearing in the flight deck.
2. An acrid odour, similar to electrical smoke.
3. Multiple engine malfunctions, such as stalls, increasing EGT, glow from rear caused by torching from tailpipes, flameout etc.
4. In dull conditions and at night St Elmo's fire/static discharges may be observed around the windshield, accompanied by a bright orange glow in the engine inlets.

Areas of volcanic dust may extend for several hundred miles. If encountered, exit as soon as possible.

The dust can cause rapid erosion and damage to internal engine components. Debris buildup and blockage in the turbine can cause surge, rapid loss of thrust and/or high EGT. Reducing thrust to idle will reduce EGT, in turn reducing the buildup of molten volcanic ash on the turbine blades and improve the engine stall margin. Further improvement in engine stall margin may be obtained by increasing the bleed air extraction through operation of the engine and wing antice systems.

It may become necessary to shutdown and then relight engines to prevent the EGT becoming excessive. If an engine fails to start, repeated attempts should be made immediately. A successful start may not be possible until the aircraft has exited the dust. Engines are slow to accelerate to idle at high altitude which may be interpreted incorrectly as a failure to start or as an engine malfunction.

The pitot system may become blocked and result in unreliable airspeed indications.

Serious damage may occur to engines, wing and tail leading edges, windscreens, landing lights etc. Abrasion of the windscreens may cause them to become opaque. If this occurs consider diverting to an airfield with a runway suitable for autoland.

INTENTIONALLY LEFT BLANK

CONTENTS

TAKE-OFF 1-3-1
  Take-Off Run
  Rejected Take-Off
  Rotation and Lift-Off, all Engines Operating
  Continued Take-Off after Engine Failure
  Take-Off Performance Margins

REDUCED THRUST TAKE-OFF 1-3-4
  Take-Off - All engines operating
  Rejected Take-off
  All Engines Climb
  Single Engine Climb

LANDING 1-3-5

INTENTIONALLY LEFT BLANK

PERFORMANCE CONSIDERATIONS

TAKE-OFF

Take-Off Run

The scheduled take-off distance assumes that take-off power is applied while the aircraft is held stationary on the brakes. However, the normal procedure of applying power after releasing the brakes adds less than 10m to the take-off distance provided the power is applied without delay. With the same proviso, a rolling start extends the scheduled take-off distance by less than 20m.

During the take-off run too heavy a forward pressure on the control column will add significantly to the drag force acting on the aircraft.

Rejected Take-Off

The Flight Manual distances are based on a technique that results in a fully braked condition being achieved within about 4 seconds of the recognition of an engine failure. When an engine failure occurs before V_1, then of course there will be more runway available for stopping, while the distance needed to stop the aircraft, from the lower speed, will be less. On a critical take-off the change of decision from 'stop' to 'go' at V_1 must be regarded as absolute, and no question of a choice of decision can be entertained.

Rotation and Lift-Off, all Engines Operating

V_R is the target speed for the initiation of rotation, and Flight Manual distances are based on a continuous rotation technique that produces nosewheel lift-off within one second of V_R, mainwheel lift-off within three seconds of V_R, and a height gain of 35ft in about 200m. The speed reached in this 200m is less than V_2+10kt in the scheduled all-engines take-off, and to ensure clearance of obstacles lying under the flight path the speed should not exceed V_2+30kt below 100ft above the runway.

ICAO SID obstacle clearance requirements specify a minimum gradient (from the departure end of the runway) of 3.3% which equates to 600fpm at 180kt. Acceleration to V_{FU} must not be at the expense of this gradient, the initial climb attitude should aim to achieve V_{FU} at about 500ft. When taking-off with 8° (NLE 6°) flap, a more nose-up attitude will have to be maintained to achieve these times and distances.

A one knot error in V_R is worth about 20m, but a one second delay in the nosewheel leaving the runway will add 60m to the take-off distance.

Continued Take-Off after Engine Failure

In the event of an engine failure recognised at V_1, the Flight Manual assumes that the rotation and lift-off technique is modified in such a way as to check the acceleration at V_2 and climb at this speed from a height of 35ft above the runway. When the engine failure is recognised after V_1, additional margin in the distance to 35ft appears at the rate of 30m per knot after V_1. If speed is in excess of V_2 at 35ft after an engine failure at V_1, this is dangerous only in the case of a limited weight take-off with obstacles to be cleared immediately after lift-off. For a thrust loss after V_R, with a speed in excess of V_2, a climb at the achieved speed (V_2+20kt maximum) must be initiated at once.

The Flight Manual assumes that the live engine will be opened to full power within 3 seconds of recognition of engine failure.

Take-Off Performance Margins

Basically, the performance margins are provided by adding 15% extra distance to the measured all-engines distance, by the obstacle clearance margin of 35 ft, and by the rarity of engine failures at precisely V_1. Additionally take-off performance is always based on Minimum Rated Thrust, which in the case of the One-Eleven is about 2.5% below the average level of full throttle thrust that will be used on the live engine in a continued take off after engine failure.

However, if at max permitted weight (runway-length-limited) a take-off is rejected following an engine failure at precisely V_1, the airworthiness standard provides only a 50:50 chance of stopping within the remaining runway when this is not more slippery than a standard wet runway. It is for this reason that the 80kt limit is set for rejecting a take-off for minor malfunctions. From this speed a safe stop is assured in all conditions.

When a wind component is present along the runway, a further performance margin is introduced by taking account of only half of a headwind component, and one-and-a-half times a tailwind component. Nevertheless in the case of light or variable winds, it is good practice to be conservative in the use of reported wind components.

The 15% margin on the normal (all engines) take-off distance typically ensures 200m to 300m of extra runway. In practice variables or imprecisely defined factors such as wind strength, total weight, rolling friction and ASI errors can combine to take up most of this margin on about 1 in 10 occasions. On such occasions when operating at or near the limiting weight for the runway, only a small margin will remain for the effect of variations in the rotation and lift-off technique.

REDUCED THRUST TAKE-OFF

The reduced thrust procedure ensures that in all cases the take-off distance with reduced thrust is never more than that which would be achieved with standard thrust at the maximum performance limited T.O.W. for the runway. The procedure requires that if an engine fails at or after V_1, full throttle thrust is applied on the live engine immediately.

Take-Off - All engines operating

The 2000kg/30 units reduction has a weight margin of approx 500kg which ensures that when using the reduced thrust procedure lift-off will be a least 50m earlier than when using the standard T.O. thrust at the maximum performance limited T.O.W. weight in the same conditions.

Rejected Take-off

The "accelerate to V_1 and stop" distance decreases by about 50m per 500kg reduction in T.O.W. For a given T.O.W. this distance is increased by about 120m when using reduced thrust. It follow that at 2000kg below the maximum performance limited T.O.W. for the runway, using reduced thrust the distance from start to stop in a rejected take-off will be 80m shorter than if the take-off was made at the maximum performance limited take-off weight and standard thrust.

All Engines Climb

The initial climb path will be slightly lower when reduced thrust is used for take-off so that ground noise after cut back will be increased slightly. However a reduced thrust take-off will generate lower ground noise before cut-back than a standard thrust take-off.

Single Engine Climb

For a reduced thrust take-off, with full throttle applied at V_1 following an engine failure, the climb gradient is better than in the corresponding maximum performance limited T.O.W. case because the aircraft weight must be 2000kg or more lower, to have permitted the use of reduced thrust.

LANDING

Performance margins are provided to ensure that the aircraft can land and stop safely in a given distance with some degree of deviation from the assumed conditions.

At sea level, ISA, with zero wind and maximum landing weight the Flight Manual minimum runway length is 1480m (wet runway).

From a 3° approach, aiming to achieve V_{AT} at 30ft wheel height and a touchdown about 380m from the threshold the actual landing distance from 30ft will be 970m. This assumes lift dump, normal reverse and anti-skid braking on a dry surface at maximum landing weight.

A 12kt tailwind increases the actual landing distance by about 280m.

The landing distance increases by approx 13m per knot of excess speed. The normal operation using V_{AT}+10kt on approach increases the above landing distance from 970m to 1100m. V_{AT}+10kt is equivalent to the 18° (NLE 20°) flap V_2 and so enables the flaps to be raised to 18° (NLE 20°) on a go-around without waiting for the aircraft to accelerate. V_{AT}+10kt also gives a margin for gusts on approach in turbulent conditions.

At a threshold speed of V_{AT}+15kt and above the risk of exceeding the scheduled minimum runway distance becomes unacceptably high. In addition, the flare manoeuvre becomes more difficult, and at speeds in excess of V_{AT}+20kt the lift from the wing in the ground attitude is greater than the aircraft weight. This situation may result in a bounce due to a sudden gust or, in an attempt to complete the flare by lowering the nose, a nosewheel first touchdown.

An extra 50ft above the glide path at the threshold increases the landing distance by approximately 300m.

The effect of the lift dumpers is to shorten the landing distance by about 100m.

Braking technique affects the stopping distance. Maximum braking effort is obtained when sufficient steady brake pressure is applied to bring the anti-skid system into operation.

On wet or icy surfaces, avoid over hasty braking and give preference to keeping the aircraft straight. On a wet runway a 5 second delay in applying wheel brakes extends the stopping distance by less than 50m, whereas misjudged correction of drift could lead to a need for heavy asymmetric braking and a consequent risk of losing tyre adhesion.

On surfaces described as extremely slippery, the increase in landing distance is approximately 400m, even with minimum threshold speed and maximum reverse thrust. Such a surface is equivalent to an almost total loss of brakes.

CONTENTS

CREW BRIEFING 1-4-1

CO-PILOTS HANDLING DURING TAKE-OFF AND LANDING 1-4-2

CO-PILOTS OPERATING P1CUS 1-4-2

COMMUNICATIONS 1-4-3

NAVIGATION EQUIPMENT 1-4-4

MONITORING 1-4-4

TAKE-OFF 1-4-6

REJECTED TAKE-OFF 1-4-6

STANDARD APPROACH 1-4-6

CONFIGURATION CHANGES 1-4-7

AUTOPILOT AND FLIGHT DIRECTOR 1-4-7

ALTIMETER SETTING AND CHECKING 1-4-8
  General
  Before Take-off
  Climb/cruise above Trans Alt
  Cruise
  Descent
  Approach
  Go-around

ALTITUDE ALERT SETTING 1-4-9

FUEL MANAGEMENT 1-4-10

RECORDS TO BE MAINTAINED 1-4-10

CHECKLISTS 1-4-12

OPERATION OF AIR CONDITIONING SYSTEM ON THE GROUND 1-4-12

ALLOCATION OF DUTIES 1-4-13
  Crew Assembly
  Pre-Flight
  Starting
  OVERHEAT/FIRE ON START-UP
  Taxy
  Take-off
  Rejected Take-off
  Climb
  Altitude calls
  Cruise
  Pre-Descent

Descent & Initial Approach
Throttle Handling
Final Approach
Automatic approach B1-11 except 400 & 539
Automatic approach (400 & 539)
Automatic approach S1-11
All approaches
Prime Land Approach
Go-around
Landing
After landing

SUMMARY OF STANDARD CALLS 1-4-28

OPERATION WITH ONLY 2 PILOTS AS CREW 1-4-32

FUEL ECONOMY 1-4-33

OPERATING POLICY

CREW BRIEFING

In the interests of mutual understanding, co-ordination and safety of operation, some form of crew briefing by the Captain is considered necessary prior to take-off and also before the approach and landing. (**NOTE** - verbose recitations are ineffective and unnecessary. A question and answer technique is more effective.)

The expression **"standard procedures"** indicates that the standard operating procedures and allocation of duties as laid down will be followed but special consideration must be given:-

In the take-off briefing to:-

Knowledge of the procedure to be used during take-off and initial climb to minimum safe altitude including:-

Emergency procedures
Return alternate
Altimeters set/cross-checked/trans alt
Terrain clearance/emergency turn
SID
FCS and radio set
Runway state/significant weather
Any ADD's affecting handling or performance
Vital data

Particular attention is drawn to the need for establishing a clear responsibility in respect of action to be taken by the Captain and First Officer during a rejected take-off.

In the approach briefing to:-

MSA's and transition level
Type of approach to be flown, allocation of duties, expected approach procedure to be followed and appropriate AOM. Set Radio and Servo DH minima.
The go-around procedure, including pattern or visual circuit to be followed.
Review of pertinent information covering use of radio aids, approach/runway lighting/marking, runway length, threshold displacement, turn off points, surface conditions, landing flap setting, reverse power, taxiways and parking guidance.

Special consideration of any abnormal aircraft or system configuration.

Special briefings for Cat 2/3a operations.

Note that additional approach briefing will be required in the event of a change of approach procedure, runway or configuration.

CO-PILOTS HANDLING DURING TAKE-OFF AND LANDING

Converting Captains or newly promoted Captains must have completed a minimum of 10 sectors in command following the final route check on type before authorising Co-pilots to handle take-offs and landings.

Co-pilots limits are set out in FCO 2068.

CO-PILOTS OPERATING P1CUS

Complete role reversal between Captains and **experienced** BA Co-pilots on a regular basis is recommended to promote effective crew integration and monitoring. At the Captain's discretion and subject to the promulgated limitations, the entire allocation of duties will normally be reversed, with the exception of signing the Tech Log and Loading Documents.

It is emphasised that the Captain's responsibility for the safe and efficient conduct of flight remain unchanged.

FCOs 2058 - 2067 refer.

CEPs and DEPs inexperienced in airline operations may not have sufficient experience to operate completely as P1CUS. Full role reversal should be practised regarding handling of the aircraft, subject to the promulgated limitations, but the management of the flight should remain with the Captain. Under these circumstances, the following items should not normally be delegated:-

Pre-flight briefing
Fuel requirements
Cabin inspection and Cabin Crew briefing
Liaison with Dispatcher and Engineer
Technical Log inspection
Checking Ships Papers

Completing the Technical Log
Post flight debriefing.

Co-pilots who have yet to complete successfully Line Continuation Training should normally be regarded as 'inexperienced' in this context. Line Continuation Training is normally given between 4 and 6 months following issue of an **initial** P2 Operations Certificate.

Exceptionally, the Captain may authorise P1CUS before the Co-pilot has completed LCT, provided he has assessed the Co-pilots performance as suitable over preceding sector(s).

In all circumstances, Co-pilots' Log Books must not be signed for P1 U/S unless full P1CUS has been undertaken.

FCO 2065 refers.

COMMUNICATIONS

R/T - The non-handling pilot will operate the R/T and be responsible for correct frequency selections. In those situations where the First Officer would have to refer to the Captain for a decision it is recommended that the Captain responds directly.

Ground Engineer - Continuous voice communication with the ground engineer is required for engine start during pushback. If voice communication cannot be established and pushback by hand signals is required, engine start must take place before pushback. Avoid the use of pilot to pilot intercom whilst the ground engineer is plugged in. During the pushback the handling pilot will be primarily responsible for communication with the engineer and the non-handling pilot will be primarily responsible for communication with ATC.

Cabin Crew - Prior to taxy, the Captain will brief the Cabin Crew on expected conditions during flight and when they may commence their cabin service.

The Senior Cabin Crew Member will report just once prior to take-off, confirming that the cabin checks have been completed. This implies that all doors and slides have been selected to Automatic. It must be assumed that the latter has been carried out as soon as the aircraft moves from the stand, unless previously agreed between the Captain and the Senior Cabin Crew Member (eg prolonged stay on stand with the jetty removed). In the event of a return to stand or reconnection of the jetty, the **"Doors to Manual"** call must be given.

10 mins prior to landing, a pilot will warn the Cabin Crew using the PA. At about 1500ft on approach the Cabin Crew will be warned to take their seats for landing by 3 chimes of the seat belt warning.

On turning onto stand a **"Doors to Manual"** call must be given. Do not turn off the Beacon until a report is received.

Seat belt/No smoking signs - The following procedures should be adopted:-

DEPARTURE, TURBULENCE NOT EXPECTED - At 1500ft:-

a)	Domestic	Seat belt sign OFF
b)	International	Seat belt and no smoking signs OFF.

Unless the Captain instructs to the contrary, the Cabin Crew will normally leave their seats once the aircraft is airborne without waiting for the seat belt signs to be switched OFF.

DEPARTURE, TURBULENCE EXPECTED - The Captain will pre-brief the Cabin Crew to remain in their seats. The SCCM will be called to the flight deck by means of the crew call button to be informed when it is safe for the Cabin Crew to unfasten their seat belts.

CLIMB/CRUISE/DESCENT - If turbulence is anticipated, the fasten seat belt signs will be switched on and accompanied by an announcement from the Flight Crew. If the Flight Crew are too busy this announcement will be made by the Cabin Crew.

APPROACH - Seat belt (and no smoking) signs will normally be switched on about 20nm from touchdown which should allow sufficient time for the Cabin Crew to complete their pre-landing checks.

NAVIGATION EQUIPMENT

Except when flying manually, the handling pilot will select radio aids as required. Accordingly the handling pilot will either inform the non-handling pilot of selections or request the non-handling pilot to make the required selections. The handling pilot is responsible for identifying radios aids; additionally the non-handling pilot will identify departure and arrival aids.

For en-route navigation where VOR/DME information is not available, cross check bearing information by keeping the ADF receivers tuned to different NDB's and cross checking overheads by basic timing/distance monitoring.

MONITORING

Push back using hand signals should be carefully monitored by both pilots in order that prompt action may be taken to terminate the pushback if necessary.

It is the responsibility of the handling pilot to ensure that the aircraft is at the correct attitude, speed, height and configuration during each phase of flight, monitored by the non-handling pilot. Distraction from this task from any cause whatever must be avoided. It is essential that control of the aircraft is maintained and that the necessary monitoring does not break down during abnormal situations. The handling pilot must continue to follow the correct flight path whilst the non-handling pilot will complete the appropriate abnormal checklist. All abnormal actions involving engine operation or major systems must be carefully monitored by both pilots. Switch selection and control operation will be made separately, allowing sufficient time for the intended result to be recognised.

Attitude, power, and altitude awareness is vital at all phases of the flight. It is the responsibility of both pilots to check the correct setting of the altitude alert system and altitude acquire (where fitted). Hurried approaches with resultant high rates of descent in the final phases must be avoided. Any distractions, such as R/T communications or irrelevant conversation, must not be allowed to interrupt crew concentration.

Excessive deviations in speed are alerted by the various aircraft systems, eg the stall warning, the gear out of position and overspeed audible warnings. The achieving and maintaining of target speeds must be monitored by both pilots. The allowable deviation cannot be stated in precise terms, particularly where altitude limits conflict with required speed changes. As a guide, a warning should be given if the trend is still continuing at ten knots from the correct target speed.

The achieved fuel distribution during flight is to be monitored by both pilots; if it is necessary to feed both engines from one tank, the estimated time of completion of cross-feeding is to be noted. Before operating the fuel crossfeed cock, select all available booster pumps on.

TAKE-OFF

The flap setting normally used should be the greater of the options given in the Performance Manual. However, the following should be taken into account:-

1. In general reduced thrust should be used whenever possible, even if this requires a lesser flap setting.
2. If the RTOW margin is small, ie less than 500 kg, consideration should be given to using a lesser flap setting provided this gives an improvement.

REJECTED TAKE-OFF

The decision to reject a take-off in the vicinity of V_1 should not be taken lightly. Once the take-off has commenced only the following criteria will be used for a "STOP" decision up to V_1:-

1. Engine/APU fire warning
2. Engine overheat warning
3. Engine failure indicated by a thrust indication of less than 95% P7 after the **"power set"** call. (For min thrust indication at 60kt see 1-1-11.)
4. Captain's decision

100% if Reduced Thrust used
97% if STD THR. used.

For engine fire, overheat or failure **either** crew member will call **"STOP"**.

During take-off, only significant malfunctions will be announced by the Non-Handling pilot. The Captain will call **"STOP"** if the take-off is to be rejected or **"CONTINUE"** if the take-off is to be continued. The Captain's decision should recognise that up to 80kt, the take-off **may** be rejected for any significant malfunction. At or above 80kt the take-off should be rejected only for major malfunctions.

During take-off, the Captain's decision will not be wholly delegated when the First Officer is the Handling pilot. In this case, apart from engine fire, overheat or failure, the First Officer can call **"STOP"** only for a significant handling difficulty or an obviously blocked runway. If the First Officer was handling the controls when **"STOP"** was called, the Captain will take control once the aircraft is decelerating satisfactorily and below 80kt. In this event, the Captain will call **"I have control"** and the First Officer reverts to standard procedures.

STANDARD APPROACH

The 1-11 Allocation of Duties requires that the pilot responsible for the take-off and landing gives control of the aircraft to the other pilot during the climb and resumes control on the approach when the required visual reference to complete the landing has been established. In the event that the required visual reference is not obtained the pilot who has flown the approach will fly the go-around.

CONFIGURATION CHANGES

The non-handling pilot will make all gear and flap selections when required by the handling pilot irrespective of whether or not the autopilot is engaged. In order to avoid the possibility of error or misunderstanding all commands involving changes of aircraft configuration must be repeated back before making the selection. When making a flap selection the non-handling pilot will check that the airspeed is appropriate and monitor that the flaps have stopped at the desired position before reporting the selection complete. Exceptionally, if the non-handling pilot is occupied, the handling pilot will make the desired configuration change by clearly announcing this intention before making the selection.

AUTOPILOT AND FLIGHT DIRECTOR

Wherever possible, it is recommended that the autopilot is engaged throughout the flight in order to achieve maximum efficiency of aircraft operation and crew monitoring. However pilots are encouraged to regularly practise manual flight both with and without the flight director in suitable conditions.

The autopilot should be engaged, if possible, during precision approach in weather conditions where it is anticipated that the required visual reference will not be established by 1000ft above decision height. Autoland (if fitted) should be used where possible in limiting weather conditions. Regular autoland practice is recommended to ensure not only flight crew familiarity but also to verify aircraft capability. All pilots are required to carry out a minimum of two autolands (in their respective roles) between simulator checks. Autolands, practice or otherwise, should therefore be recorded in pilots' personal Log Books. In good weather conditions either pilot may practise automatic or manual approaches. Standard callouts will be made irrespective of weather conditions.

ALTIMETER SETTING AND CHECKING

General

When a QFE or QNH is given to a decimal place, the figure is to be rounded down to the nearest whole number except when carrying out altimeter checks on the ground.

Before Take-off

Set the QNH on all three altimeters and check that they indicate the airfield elevation plus or minus the calibration error. On each servo altimeter set the 'bugs' to:-

1. airfield elevation + 500ft
2. Ha.

Climb/cruise above Trans Alt

When cleared to a Flight Level set 1013 on Captain's and First Officer's altimeters before passing through the Transition Altitude.

Cruise

Whenever, during cruise, terrain clearance is likely to be marginal, (ie less than 2000ft) set the local area QNH on the standby altimeter. Otherwise set the destination QNH on the standby.

Descent

Set the destination QNH on the standby altimeter. Set the QNH on all altimeters before descending below Transition Level. The QNH received from ATC is to checked against the forecast figure in order to guard against human error. On each servo altimeter set the 'bugs' to:-

1. Decision height
2. Decision height + 100ft

Approach

NOTE - Do not reverse the order of these checks on First Officer handling sectors.

Set the QFE (touchdown QFE when available) on the Captain's altimeter and cross check airfield elevation against First Officer's altimeter. In addition, check the QFE supplied by ATC using the 30ft per millibar relationship or by applying the Approach Plate touchdown QFE millibar correction to the QNH.

Set the QFE (touchdown QFE when available) on the First Officer's altimeter and cross check against the Captain's altimeter.

Go-around

Set the First Officer's altimeter to QNH and the Captain's altimeter as required, depending on whether another approach or a diversion is necessary.

NOTES:

1. **SRA** - If carrying out a QNH SRA the First Officer's altimeter will remain on QNH throughout the approach, and a QNH DA will be used.
2. **Eastern Europe** - In states which issue clearances below Transition Level directly on the QFE, use the following procedures:

   Approach - do not set an interim QNH, but set QFE on both servo altimeters, cross-checking against the forecast QFE. Verify airfield elevation against standby altimeter set to QNH.

   Departure - Set QFE on both servo altimeters until passing Transition Height, then set 1013. Set QNH on standby altimeter.

ALTITUDE ALERT SETTING

Departure

During the Pre-start FCS check, the handling pilot will set the first cleared altitude/FL, if known, otherwise the aerodrome elevation.

A confirmation or reset will be made as part of the 'ATC Clearance' item in the Taxy Check.

Flight

After any level change instruction from ATC, the non-handling pilot will set the new level. Both pilots will check that the ATC readback, autopilot altitude preselect (where appropriate) and altitude alert levels are the same.

Approach

Once the aircraft is cleared for final approach, the altitude alert will be set to zero.

At 1000 ft aal on the approach, the G/A altitude will be set.

FUEL MANAGEMENT

When selections are required on the fuel systems panel in flight, both pilots must be involved. If both engines are to be fed from one wing tank an estimated time to completion of balancing must be recorded on the SWORD. Before operating the fuel crossfeed cock, select all available booster pumps on.

RECORDS TO BE MAINTAINED

The First Officer, or Captain if roles are reversed, should record the following on each sector (return the documentation to the appropriate collection point):-

> On SWORD page 1, the TOW, ZFW, Stab trim, Pax, Fuel loading, planned fuel alternate, extra fuel reason, achieved FL, arrival holding time and reason. If non limiting, weights may be rounded UP to the next 100 kg and recorded to one decimal place only (eg 37854 kg becomes 37.9). ATC clearances, NAV record and fuel checks should be recorded on SWORD page 2 and beyond. AWO forms and Flight Crew Reports (usually from the Captain) should be completed as required.
> * There is no requirement to retain Vital Data cards.

A copy of the Load Sheet should be retained and attached to the relevant SWORD. The SWORD and Load Sheet must be filed as a record of the flight.

Late Close Out Procedure

Procedure - A provisional loadsheet will be presented by ETD-20. The Captain should check and sign it, returning the top copy to the despatcher and retaining the second copy.

If the fuel figure is changed after signing the loadsheet, obtain another loadsheet.

Reference Speed Booklet. Calculate the take-off performance and complete the vital data card. At the appropriate point in the Pre-start checklist, display the next highest page above that including the provisional TOW, eg if the provisional TOW is 38.3, display the page 38500-39000. Do not display a page higher than that including the maximum take-off weight for the ambient conditions.

Set the speed bugs accordingly.

Calculate V_{MO} assuming a Zero Fuel Weight 500 kg in excess of that on the provisional loadsheet.

Set the provisional loadsheet TPI setting.

Assuming the take-off weight will be the provisional take-off weight + 500 kg, determine whether reduced thrust is permissible and set the thrust indices accordingly.

Taxying. Before starting the Taxy Checklist, but not less than 4 mins after doors closed, the non-handling pilot will call Company, give appropriate chocks off time and **"request final figures"**.

Company will reply in the following manner:-

Speedbird XXXX
No significant change **OR** changes from issue 'X'
Zero fuel weight 32 decimal 3
Take-off weight 38 decimal 1
Total on board 63 plus 1

and Stabilizer 2 decimal 8 (ONLY IF CHANGES TRANSMITTED)

The non-handling pilot will readback.

Confirm that the issue number of the provisional loadsheet on board is the same as that transmitted by Company. If not, return to stand for a new loadsheet. Record the new weights and the new stab trim setting (if any) in the spaces labelled 'ACT'.

"No Change" means that there is no need to adjust speed bugs, flaps, reduced thrust etc before take-off.

"Changes from Issue X" means that it will be necessary to:-

1 Check that the flap setting is valid for the actual take-off weight.
2 Reset Reference Speed Booklet & speed bugs.
3 Recalculate V_{MO}.
4 Re-assess the reduced thrust calculation.
5 Reset TPI setting.

P1/P1CUS will start the Configuration Check by confirming that the final loadsheet figures have been received and actioned.

At a suitable time in flight, recalculate the revised landing weight and transfer all final figures to SWORD page 1.

Approach. For landing reference speeds - use revised landing weight.

Tolerances - If the final loadsheet figures are within +500 and -2000 kg of the provisional loadsheet, it will not be necessary to rebug the take-off speeds. If the final TPI setting is within 0.5 of the provisional figure, it will not be necessary to retrim.

CHECKLISTS

P1/P1CUS is responsible for initiating checklists at the appropriate time to be actioned by the non-handling pilot. A solid line linking the item to the required action indicates that it must be read aloud, and both pilots must check that the correct action has been taken. A broken line indicates that the item should not be read out when actioned. The after take-off, go-around and 'boxed' sections of the abnormal checklists (eg Engine Fire/Overheat and Shutdown) should be actioned from memory, whether spoken or silent. Memory drill items need not be called when subsequently checked from the checklist.

On completion of a checklist, the non-handling pilot will confirm completion, eg **"Climb Checklist complete"**.

OPERATION OF AIR CONDITIONING SYSTEM ON THE GROUND

A pilot or qualified engineer must remain on the aircraft if the air conditioning system is in operation.

Whenever passengers are on board the aircraft and the air conditioning system is in use, a pilot or qualified engineer must remain on the flight deck.

ALLOCATION OF DUTIES

The following allocation of duties are specified for the workload associated with normal operation. However, the Captain must assess any exceptional workload arising from non-normal conditions and assign revised duties as necessary.

CAPTAIN | **FIRST OFFICER**

Crew Assembly

Report to Crew Control one hour prior to STD. Read Urgent Ops Info Board, FODN's, FCN's, Fleet and Confidential Notices.

CAPTAIN	FIRST OFFICER
Check aircraft tech status, MET and AIS BRIEF. Brief First Officer as necessary. Approve fuel requirement.	Collate and check where necessary all flight documents including SWORD fuel plan, Aerodrome booklets, supplementary forms and charts as required, Vital Data cards, ATC Flight Plan when required, etc. Maintain the required records throughout the flight.

Pre-Flight

Arrange for arrival at the aircraft with sufficient time (normally STD -30) to complete the required checks and ensure a punctual departure.

Complete the Exterior Check. Liaise with A/C Dispatcher and Engineer. Inspect the Cabin and receive SCCM report; brief cabin crew as necessary. Inspect Tech Log.	Complete Full or Turnround Checks as necessary by 10 minutes before STD. Obtain ATIS.
Carry out the radio checks if required. Cross check performance data calculation and completion of vital data card.	Calculate performance data and complete Vital Data card.
Estimate take-off weight and display the relevant Speeds Booklet page for desired flap setting as a gross error check.	
Check fuel contents.	Cross check fuel contents

Sign Tech Log.	
Call for Pre-start Checklist.	Read Pre-start Checklist.
Read out ZFW, TOW, LW, No. PAX, TPI.	Record ZFW, TOW, LW, No. PAX, TPI.
Check and sign ships papers.	
Cross check T/O thrust calculation.	Calculate whether thrust reduction permissible.
Check setting.	Set thrust indices
Agree vital data and set ASI indices.	Set Speeds Booklet, ASI indices and TPI.

Starting

Obtain Engineer's Start clearance.	Obtain start/pushback clearances.
Give push-back clearance to Engineer if appropriate.	
Action engine starting sequence. Check HP cocks locked open. Call "Engines stabilised".	Monitor engine start.
Call for rest of Start Checklist. Action remainder of Start Checklist.	Read Start Checklist.

OVERHEAT/FIRE ON START-UP

The 'Overheat/Fire on Start-up' Allocation of Duties are not reversed during PICUS sectors.

If operating HP cock select both closed. Warn ATC. Check with Ground Engineer. State intention. Inform cabin crew of intention.	Execute engine overheat/fire or APU fire on start drill.

Taxy

Obtain Engineer's visual clearance for taxying.	Obtain and record ATC taxy clearance. Confirm engineers taxy clearance.
Taxy the aircraft, operate throttles. Maintain lookout.	Maintain lookout. Advise Captain when making company call.
Call for taxy checklist when clear of other aircraft. Check reverse thrust (if required) and rudder. Monitor checklist and action items as required.	Read out and action appropriate taxy checklist items. Maintain an especially good lookout during configuration check.
Receive SCCM's report.	
Monitor ATC clearance.	Copy and readback ATC clearance.
Check approach clear before entering runway. Call for Entering Runway Checklist.	Obtain take-off clearance. Confirm approach clear and complete Entering Runway checklist.

Take-off

Call **"Set Power"**. Release brakes as power is applied. Start stopwatch as aircraft rolls.	Apply take-off power and check brake pressures zero. Start stopwatch as aircraft rolls.
	Call **"power set"** when take-off power achieved. Check engine indications.
Control the aircraft.	Cross check speed on both ASI's.
Rotate at V_R.	Monitor engine instruments. Call **"80kt"**, **" V_1"**, and **"rotate"** (but omit the V_1 call if V_1 and V_R are coincident). Move hand to base of throttles at V_1. Engine failure above V_1 - open throttles fully.

Rejected Take-off

If it becomes necessary to reject the take-off the operative call from either crew member is **"STOP"**.

Apply full, or required, brake pressure to ensure a stop in the available distance. If the brakes malfunction, release the applied pressure, call for anti-skid Off and re-apply the brakes. If the footbrakes are still ineffective use the handbrake.	Close the throttles. Select the lift dumpers out. Select Reverse Idle on both engines and Emergency Reverse on operative engine(s). Call out achieved brake pressures. Stand by to select anti-skid off.

The following Allocation of Duties is not reversed on P1CUS or Co-pilot handling sectors

If the First Officer was handling the controls, take control when the aircraft is decelerating satisfactorily and below 80kt calling **"I have control"**. When stopped call for the relevant Emergency Checklist.	The First Officer reverts to standard non-handling procedures when the Captain takes control. Action the required Emergency Checklist.

Climb

	Cross check flight instruments and when a positive climb established call **"positive climb"**.
Respond by calling **"gear up"**.	Select and call **"gear up"**, check red lamp on. Switch off and retract landing lamps. From V_R to 500ft monitor height, attitude, airspeed. Call attention to errors with 'Height', 'Attitude', or 'Speed' as appropriate.
At 500ft check V_{FU} has been achieved and call **"Flaps zero"**.	Check that V_{FU} has achieved and select flaps to zero, set noise abatement power. Simultaneously call **"Speed checked, flaps zero, power"**.
Speed below V_{FU} at 500ft (18° (NLE $13^\circ/20^\circ$) flap T/O): Check speed within 10kts of V_{FU}. Call **"Flaps $8^\circ(6^\circ)$"**. Check V_{FU} is achieved. Call **"Flaps zero"**.	Check speed within 10kts of V_{FU}. Select $8^\circ(6^\circ)$ flap. Call **"Speed checked, Flaps $8^\circ(6^\circ)$"**. Check V_{FU} is achieved. Select flaps zero, set noise abatement power. Simultaneously call **"Speed checked, flaps zero, power"**.
(S1-11) Call **"Flight Director"** if required.	**(S1-11)** Engage Flight Director if requested.
Approaching 1500ft call **"Air changeover"**.	Select air changeover and airframe anticing if required. Select start/relights off. Call **"Airconditioning set, anticing OFF"** (or ON as req'd). Adjust noise abatement power.
At the end of the noise abatement climb (usually 4000ft) re-check flaps zero and call **"Flaps are zero, climb power and climb checklist"**.	Re-check flaps zero, set climb power, check completion of After Take-off Checklist, and execute Climb Checks.
Engage autopilot as soon as practicable.	

Confirm **"1000ft to go"** when approaching cleared FL/altitude.	Call **"1000ft to go"** when approaching cleared FL/altitude.
After the completion of the Climb Checklist ask **"Ready for handover?"**	Respond **"Ready"**
Call **"You have control"**.	Reselect compass switch (if fitted) and say **"I have control"**.
Manage and monitor the flight. Operate R/T.	

Altitude calls

Throughout the flight

Call **"1000ft to go"** when approaching cleared FL/altitude.	Confirm **"1000ft to go"** when approaching cleared FL/altitude.
Call **"Level Check"** when passing FL100 & FL200.	Respond by stating level and confirming cleared level or altitude, e.g. **"Passing FL100, climbing FL120"**.

Cruise

Monitor power settings and speeds. Manage and monitor the flight.	Control and navigate aircraft on automatics. Select, identify and point radio aids.
If autopilot is U/S, select, identify and point radio aids.	If the autopilot is U/S, fly aircraft.
Obtain weather information as required - only ATIS is required on short sectors of about 1 hour, provided no weather problems are anticipated. Pass messages on Company frequencies. Make PA announcements to passengers as necessary. Advise Co-pilot whenever off ATC watch.	
Monitor fuel selections.	Carry out fuel management drills.
Estimate holding potential.	Carry out fuel check.

Pre-Descent

Obtain surface conditions wind components and RVRs as required. Set standby altimeter to destination QNH. Brief for the approach. (Refer to 'Briefing', 1-4-1)	Cross-check briefing, determine descent point.
Establish V_{AT}, set ASI indices and cross-check.	Establish V_{AT}, set ASI indices and cross-check.
Establish Decision Heights and Limiting RVR or Visibility. Set servo altimeter bugs to DH and DH+100ft. Set radio DH if applicable. Cross-check. If necessary, check all requirements for Cat 3/2 and reversion to Cat 2/1.	Check and bug servo DH and DH+100ft. Set radio DH if applicable. Cross-check.

Descent & Initial Approach

Initiate and complete Descent Checks.	Control aircraft.
Monitor, with particular reference to MSA/SSA's, the handling pilot's compliance with the approach procedure. Monitor compliance with ATC instructions and speed control, inform handling pilot of any discrepancy.	Comply with ATC clearances and approach procedure.
Switch on turn-off lights when passing FL100.	
If required, request Cat 2 or Cat 3 protection.	
Set FCS for approach and cross-check. Identify approach and landing aids.	Set FCS for approach and cross-check. Identify approach and landing aids. **ILS/VOR approach** - re-check facility ident when established inbound on QDM/localiser if required. **NDB approach** - continuously monitor NDB ident.
Initiate and complete Approach Check.	
Announce **"10 minutes to go"** on the PA.	

Throttle Handling

If the autothrottle system is engaged, operation will be monitored by the following means:-

1. S1-11 a/c: The mode indicator and, after GP capture, red MWS.
   B1-11 a/c: Autothrottle disengage light.
2. The achieved IAS on the ASIs.
3. Hand monitoring of throttle movement; this will be continuous from 1000ft QFE.

The following power setting procedures will apply when autothrottle is engaged:-

Monitor speed selections.	Dial speeds as required. Call speeds selected eg **"Dialling to achieve 146kt"** and monitor throttles and achieved IAS. If autothrottle cuts out on final approach, initially set 88% (11000) HPrpm.

Final Approach

Call **"Localiser active"** and **"Glidepath active"** as appropriate. When cleared for approach set alt. alert to zero.	
Monitor handling pilot. Check annunciators.	Operate autopilot or fly manually following FD commands if applicable. Check annunciators.
For an ILS approach:-	
S1-11 (manual) & B1-11 - Select FD modes. Set FD pitch cmd knob 10° NU on G/P capture. **All types -** Check cmd bars do not follow selector.	**S1-11 (auto) & B1-11 -** Select FD modes. Set FD pitch cmd knob 10° NU on G/P capture. **All types -** Check cmd bars do not follow selector.
All Approaches:-	
Receive SCCM's report.	
Complete the landing checklist.	
At OM check height, start stop watch. Check ROD on VSI and/or by stopwatch and altimeter.	At OM check height, start stop watch. Check ROD on VSI and/or by stop watch and altimeter.
Set alt. alert to go-around altitude.	
By 1000ft AAL check surface wind component and if appropriate, the RVR. When using Cat 2 or 3a weather minima, establish and state whether Cat 1 or Cat 2 reversion is available: **"Cat 3 autoland"** or **"Cat 2 autoland/approach"** + **"No reversion"** or **"Cat 2/1 reversion available"**.	

For automatic approach - B1-11 except 400 & 539 aircraft:

Monitor selections and indications.	Select Prime Land or Glide Gearing at 1,200 ft QFE. (or by 800 ft at the latest).
Respond **"Flags clear"**.	For Prime Land check: AP annunciator shows Land LFA annunciator shows Glide ILS flags clear Call **"Prime land, land and glide, flags clear"**.
Respond **"Flags clear"**.	For Glide Gearing check: AP annunciator shows Glide LFA annunciator shows Glide ILS flags clear Call **"Glide gearing, glide and glide, flags clear"**.
For prime land approach: Monitor change from GLD to ARM. Respond to "arm " call by calling out radio height, commence monitoring radio height. Cross check against servo altimeter.	For prime land approach: At 400ft check land annunciator changes from GLD to ARM. Call **"ARM"**. Check radio altimeter indications. Commence monitoring radio height.
For any malfunction (except one for which reversion to Cat 2 is permitted, i.e. autothrottle disconnect or autotrim light on below 100ft R) identify the fault, call go-around or advise new minima as appropriate.	

For automatic approach - B1-11 400 & 539 aircraft:

	Select Cat 1 or Cat 2 at 1200ft QFE (or by 1000ft QFE at the latest).
Check annunciator shows C1/C2. Check ILS flags and respond **"Flags clear"**.	Check annunciator shows C1/C2. Check ILS flags and call **"Cat1 (or Cat2), flags clear"**.
For Cat 2 approach: At the 400ft Radio call, call out actual radio height, commence monitoring radio height. Cross check against servo altimeter.	For Cat 2 approach: At 400ft radio, call **"400ft radio"** and monitor radio height.
For any malfunction identify the fault, call go-around or advise new minima as appropriate.	

For Manual ILS - B1-11 aircraft:

	At 1000 ft check ILS flags and call **"1000 ft, flags clear"**.
Check ILS flags and respond **"Flags clear"**.	

For automatic approach - S1-11:

Monitor selections and indications.	Select Prime Land or Glide Gearing at 1,200 ft QFE. (or by 800 ft at the latest).
Respond **"Flags steady".**	For Prime Land check: 4 (3 if autothrot not used) mode lights Annunciator shows GLD ILS flags steady Call **"Prime land, GLD, 3/4 mode lights, flags steady".**
Respond **"Flags steady".**	For Glide Gearing check: 3 mode lights Annunciator shows GLD ILS flags steady Call **"Glide gearing, GLD, 3 mode lights, flags steady".**
For prime land approach: Monitor change from GLD to ARM. Respond to "arm " call by calling out radio height, commence monitoring radio height. Cross check against servo altimeter.	**For prime land approach:** At 400ft check land annunciator changes from GLD to ARM. Call **"ARM".** Check radio altimeter indications. Commence monitoring radio height.
For any malfunction (except one for which reversion to Cat 2 is permitted, i.e. autothrottle disconnect or autotrim light on below 100ft R) identify the fault, call go-around or advise new minima as appropriate.	

For Manual ILS - S1-11 aircraft:

Check ILS flags and respond **"Flags steady".**	At 1000 ft check ILS flags and call **"1000 ft, flags steady".**

All approaches (B & S1-11):

Continue to monitor flight path whilst seeking visual reference.	At 100ft above DH - prepare for go-around at decision height. Call **"100 above"**.
With adequate visual reference call **"Land"**, take over control and continue the approach - otherwise call **"go-around"**.	At DH Call **"Decide"**. If "go-around" called or no reply made initiate go-around. However, in Cat 3a conditions P2 may continue an autoland if the Captain is incapacitated.
Observe the minimum autopilot disconnect height.	Monitor displays, autopilot performance. Check ROD less than 1000fpm. Inform handling pilot of discrepancies.

Prime Land Approach:

	At 100ft Radio: Check land annunciator changes to ATT. Check ROD, inform handling pilot if exceeding 1000fpm. Check power, advise if abnormal.
At 50ft Radio **(manual landing only)**: Disengage autopilot and autothrottle and continue normal manual landing.	At 50ft Radio **(manual landing only)**: Call **"Land Manual"**. Check autopilot MI (if fitted) displays OFF and autothrottle disconnected.
At 50ft Radio **(Autoland only)**: Monitor approach accuracy by visual reference.	At 50ft Radio **(Autoland only)**: Check land annunciator changes to Blank (B1-11 Flare and Retard), call **"Flare"**.
Press autopilot and autothrottle disconnect buttons at touchdown or earlier if "Land manual" call made .	Call **"Land manual"** if incorrect indications on land annunciator or on observing any other malfunction of autopilot or autothrottle.
	Check autopilot MI (if fitted) displays OFF and autothrottle disconnected.

Go-around:

Once initiated, a go-around must be completed by the handling pilot.

Check autopilot disengaged, and full power applied. Respond by selecting flaps and calling **"Flap 18° (NLE 20°)"**. Check satisfactory transition to the climb.	Call **"Go-around. Flap 18° (NLE 20°")**. Disconnect the autopilot (and autothrottle) and apply full power. Rotate aircraft into the climb attitude.
Call **"Positive climb"**. Select and call **"Gear up"**.	Respond by calling **"Gear up"**
Respond by calling **"Speed checked, flaps zero, power"** and selecting flaps to zero and setting Climb (or less) Power.	On reaching V_{FU} call **"Flaps zero"**. Continue to handle the aircraft. Monitor power selections.
Complete the Go-around Drill memory items.	Call **"Mode selector off (S1-11 FCS to Steer), altimeters"**.
Monitor correct execution of the go-around procedure.	Engage autopilot as soon as practicable.

Landing

Disconnect the autothrottle when crossing the runway threshold (manual landing).	Check ROD and inform handling pilot if over 1000 fpm. Check and call rpm settings.
At touchdown call **"Dump"**.	Select lift dumpers Out. Select reverse idle then reverse thrust unless otherwise briefed.
Keep aircraft straight with rudder fine steering.	
Apply brakes as necessary.	Check and call initial brake pressures.
By 60kt call **"Reverse idle"**, followed by **"Forward idle"** if reverse thrust is no longer required.	Call **"60kt"**. Respond by selecting reverse idle, then (provided rpm below 75% (9500) HPrpm) forward idle. If engine rpm falls below 44% (5500) close the HP cock immediately.
At the end of the landing roll, at taxying speed, with no brake pressure applied, call **"Anti-skid Off"**	Select anti-skid off.

After landing

Taxy aircraft and maintain look out.	Maintain Look out.
Call for After Landing Checks.	Complete the After Landing Checks. Monitor brake accumulator pressures during taxying.
	Approaching the stand call on the PA **"Cabin crew, doors to manual"**.
When parked on stand call for Shutdown Checklist or Full Shutdown Checklist as applicable.	Complete the Shutdown Checklist or Full Shutdown Checklist as applicable.
Apply Handbrake, release when chocks in place.	
Complete and sign the Tech Log.	Check documentation completed as required and return it to the appropriate collection point.

SUMMARY OF STANDARD CALLS

All calls are reversed between Captain and First Officer during PICUS sectors.

CAPTAIN	**EVENT**	**FIRST OFFICER**
GENERAL		
"Beacon on, starting engines"	ENGINE START	
"Engines stabilised"		
"Set Power"	TAKE-OFF	"Power set, 80kt, (V_1), rotate" "Positive climb"
"Gear up"		"Gear up"
("Flaps 8°/6°")	500ft	("Speed checked, flaps 8°/6°")
"Flaps zero"		"Speed checked, flaps zero, power"
"Air changeover"	1500ft	"Airconditioning set, anticing off/on"
"Flaps are zero, climb power, climb checklist"	END OF NOISE ABATEMENT	"After take-off & Climb check complete"
"Ready for handover?" "You have control"		"Ready" "I have control"
"1000ft to go"	APPROACHING CLEARED FL/ALTITUDE.	"1000ft to go"
"Level Check"	PASSING FL100, FL200	"Level XXX, climbing/descending FL XX or X thousand feet"

AUTOMATIC APPROACH B1-11

CAPTAIN	EVENT	FIRST OFFICER
"Localiser active / Glidepath active"		
"10 up"	GP CAPTURE	"10 up"
"Flags clear"	1200ft servo	"Prime land, land and glide. Flags clear" or "Glide gearing, glide and glide. Flags clear" or 400 & 539: "Cat 2, flags clear" or "Cat 1, flags clear"
For Cat 2/3a approaches:		
"Cat 3 autoland" or "Cat 2 autoland/approach" + "No reversion" or "Cat 2/1 reversion available"	1000ft servo	
"XXX feet radio"	400ft R	"Arm" or 400 & 539: "400ft radio"
For all approaches:		
	100ft ABOVE DH	"100 above"
"Land"	DECISION HEIGHT	"Decide"
For automatic landing:		
	50ft R	"Flare" ("Land Manual")
For Cat 2 Manual landing:		
	50ft R	"Land Manual"

CAPTAIN	EVENT	FIRST OFFICER
AUTOMATIC APPROACH S1-11		
"Localiser active / Glidepath active"		
	GP CAPTURE	"10 up"
"Flags steady"	1200ft servo	"Prime land, gld, four (three) mode lights, flags steady" or "Glide gearing, gld, four (three) mode lights, flags steady"
For Cat 2/3a approaches:		
"Cat 3 autoland" or "Cat 2 autoland/approach" + "No reversion" or "Cat 2/1 reversion available"	1000ft servo	
	400ft R	"Arm"
"XXX feet radio"		
For all approaches:		
	100ft ABOVE DH	"100 above"
	DECISION HEIGHT	"Decide"
"Land"		
For automatic landing:		
	50ft R	"Flare" ("Land Manual")
For Cat 2 manual landing:		
	50 ft R	"Land Manual"
MANUAL ILS APPROACH B1-11		
"localiser active / Glidepath active"		
"10 up"	GP CAPTURE	"10 up"
"Flags clear"	1000ft servo	"1000ft flags clear"

CAPTAIN	EVENT	FIRST OFFICER
	100ft ABOVE DH	"100 above"
"Land"	DECISION HEIGHT	"Decide"
MANUAL ILS APPROACH S1-11		
"Localiser active / Glidepath active"		
	GP CAPTURE	"10 up"
"Flags steady"	1000ft servo	"1000ft flags steady"
	100ft ABOVE DH	"100 above"
"Land"	DECISION HEIGHT	"Decide"
LANDING (All types)		
"Dump"	LANDING	
		"(Brake pressures)"
		"60kt"
"Reverse idle" "Forward idle" "Anti-skid off"		
GO-AROUND (All types)		
	DECISION HEIGHT	"Decide"
"Go-around"	GO-AROUND	
		"Go-around, Flap 18° (20°)"
"Flap 18° (20°)"		
"Positive climb"		
		"Gear up"
"Gear up"		
	V_{FU}	"Flaps zero"
"Speed checked, flaps zero, power"		
		"Mode selector off (or, S1-11 FCS to steer), altimeters"

OPERATION WITH ONLY 2 PILOTS AS CREW

When it is necessary to operate with the minimum crew of 2 pilots and no cabin crew, the following additional instructions should be observed:-

If catering is carried, check that it is correctly loaded and secured.

The cabin and toilets should be inspected for security prior to flight.

Automatic slides may be armed at the discretion of the Captain.

Prior to flight trip the following circuit breakers:-

S1-11 & B1-11 400 Series

B1, B19, B20, B22	- Galley services
B73	- Toilet water heater
B81	- Toilet extraction fan

B1-11 Except 400 & 539 Series

B19, B20	- Galley services
B76	- Toilet water heater
B84	- Toilet extraction fan

B1-11 539 Series

B7, B8, B19, B20	- Galley services
B76	- Toilet water heater
B84	- Toilet extraction fan

Galley power may be reinstated when necessary to prepare refreshments.

The flight deck door should be kept open during flight, so that the cabin may be observed.

The cabin and toilets should be inspected at least once per hour during flight.

If a slide was armed remember to disarm it immediately after engine shut-down.

Reset all Cbs after flight.

An extended aft trim limit may be used on S1-11 and B1-11 539 series for positioning flights only. See Flight Handling 1-1-ix for limitations.

FUEL ECONOMY

The following notes are intended to provide guidance to crews regarding fuel conservation. They are not to be interpreted as operational limitations.

APU

Provided climatic conditions are appropriate and ground power is available, delay starting the APU until 15 mins prior to departure. When boarding passengers using the rear stairs, it is permissable to delay starting the APU until the passengers are on board.

After landing, delay starting the APU until 2 mins before arriving in the area of the Terminal, unless single engine taxy is to be carried out. If the taxy time is short and the crew are confident that ground power will be available immediately the aircraft arrives on stand, it is permissable not to start the APU.

On parking use ground electrical power whenever it is available and shut down the APU once passengers are disembarking unless operational or climatic conditions dictate otherwise.

Fuel

Only carry fuel in excess of SWORD if it is operationally essential, or tankering is recommended on SWORD.

Prior to departure, ensure that the Tech Log and SWORD accurately record the fuel quantity indicated on the gauges or obtained from the drips. This will enable accurate statistical analysis to be carried out by the Fuel Group.

Engines

After landing, use the single engine taxy procedure, unless the taxy time after landing is very short, or there are other operational reasons.

Descent

Where possible arrange the descent so that use of airbrake is not required.

Approach

A continuous descent approach is the most fuel efficient technique.

When it is expected that the approach will be carried out in visual conditions from at least 1000ft AAL, then gear and flap selection may be delayed in the interest of fuel economy. As a guide, gear selection may be delayed until 1500ft QFE, and the final flap setting made so that the aircraft is fully established in the landing configuration by no later than 800ft QFE.

The use of 26° flap for approach and landing saves fuel and reduces noise on the approach. It should be used whenever conditions permit - see Flight Handling 1-1-30. Use of harsh braking or normal reverse thrust should be avoided since increased brake and engine wear negate any cost saving. Be alert to the position of preceding traffic. This is important at busy airports such as Heathrow, where approach separation is often kept to a minimum.

CONTENTS

FULL CHECKS 1-5-1
  Flight Deck Preliminaries
  Port instrument panel
  Centre instrument panel
  Starboard instrument panel
  Starboard console
  Roof panel
  Control pedestal

EXTERNAL 1-5-14

TURNROUNDS 1-5-15

PRE-STARTS 1-5-16

START 1-5-17

TAXYING 1-5-19

ENTERING RUNWAY 1-5-20

AFTER TAKE-OFF 1-5-20

CLIMB 1-5-20

DESCENT 1-5-21

APPROACH 1-5-21

LANDING 1-5-22

GO-AROUND 1-5-23

AFTER LANDING 1-5-23

SHUTDOWN 1-5-24

FULL SHUTDOWN 1-5-24

INTENTIONALLY LEFT BLANK

B1-11 AMPLIFIED CHECKLIST

NOTES

1. Do not move any control lever which is apparently out of position without first checking with Engineers.
2. The Full Checks are presented in a form to permit an orderly scan of the panels.
3. The requirement to 'test' some warning lamps which will be illuminated is to ensure that they are pushed in and not isolated from the MWS.

FULL CHECKS

Flight Deck Preliminaries

1.	Battery/Essential AC	Check.
	Air Conditioning	Off. Master valves closed, air delivery and X-feed closed, cooling fan isolated. This is to prevent air conditioning overheat as power is removed from the cooling fan.
	Battery switch	On.
	APU/GPU	Trip.
	DC fail lamp	On. Shows that the main DC busbar is isolated from the essential DC busbar.
	Battery M1	On. Shows that the battery and essential DC busbars are connected.
	Essential AC	115v/400 cps.
	Inverter MI (if fitted)	"INVERT". These checks show that the static inverter system is serviceable.
	Battery voltage	23 volts minimum. Press battery volts button to check a minimum 23 volts under the load of the inverter.
	Normal electrics	Restore if GPU available or APU running.
	Air conditioning	Restore if APU running (see below).
2.	Fire control handles	In.
3.	Firebottle discharge inds	Amber.

4.	APU	Start, if GPU unavailable or air conditioning required.
	Fire switch	Manual.
	Fire handle	In.
	Fire warning	Test.
	Oil LP lamp	Test.
	Check clear for start up.	
	Start master	APU.
	Control switch	On, check fuel valve open.
	Start button	Push (2 seconds).
	EGT	Check
	Indicator	'START', 'blank' then 'RUN'.
	Oil LP lamp	Out.
	EGT	Monitor.
	Start Master	Off, within one minute.
	Fire switch	Auto.
	Generator	Check (APU generator fail lamp out, 115v/400cps).
	Air conditioning	May be introduced one minute after APU start.
	Cooling fan switch	Normal.
	Air delivery valve	Open.
	Air crossfeed valve	Open.
	No.2 master valve	APU.
	No.2 temp control	Auto.
5.	Exterior lights	On. (Ice insp, nav, beacon, wheelwell, fin (if fitted), turn-off.)
6.	Nosewheel visual ind	Green, full disc. (Requires wheelwell light on.)
7.	Aircraft documents	Check. Check the Weight and CG balance extract.
8.	Pressurisation amplifier lamp	Out. If illuminated the adjacent Ground Test/Flight switch has been left at 'Ground' and the diff pressure will rise rapidly when the last a/c door or window is closed.
9.	Power failure lamp (if fitted)	Test. This will be On if GPU is powering electrical system, Out if APU is on line.
10.	Cb's	Check set.
11.	Aircraft library	Check.
	Weight Schedule	
	Quick Reference Handbook	(2 copies)
	Checklist	(2 copies)
	Reference Speeds Booklet	(2 copies)
	Performance Manual	
	Charts Wallet	
	Flying Manual	
	Technical Manual	
	Flight Crew Orders	
	FODN's and FCN's	

- Load and Balance Manual
- Allowable Deficiencies
- Aerad Europe Supplement
- AWO Report Forms Pad
- Spare forms wallet
- IATA Handbook of Restricted Articles
- Fuse and cb location card or manual
- Cabin Crew Manual
- Cabin Crew SEP Manual
- Certificates file containing:
  - Certificate of Airworthiness
  - Certificate of Registration
  - Noise Certificate
  - Aircraft Radio Licence
  - Certificate of Approval of A/c Radio Installations
  - Certificate of Insurance
- Back-up Manual (2 copies of each)
- Diversion Diagram manual
- Emergency Airfields Manual
- Route Briefing Manual
- Topographical map.

12.	Spare headset	Stowed.
13.	Cooling fan switch	Normal, shutters (if fitted) auto.
14.	Engine start lamps	Press to arm (if fitted).
15.	Emergency equipment	Check. 1 crew life jacket for each flight deck seat. A/c with drop down O_2 masks:- 2 smoke masks. 2 pairs smoke goggles A/c with quick don Sierra masks:- 523, 528 4 pairs 400, 539 3 pairs smoke goggles. A/c with 4th F/Deck seat:- Therapeutic O_2 mask. Fixed O_2 system. 1 BCF extinguisher. 2 escape ropes. 2 MSA smoke hoods. 1 fireaxe. 1 Passenger restraint pack.
16.	Standby steering	Off, test lamp. If lamp is illuminated, the standby steering accumulator pressure has fallen below 2000 psi. Do not pressurise No. 1 system without engineering clearance.

17.	Radar, radios, fans, a/pilot,	
	Radar	Standby, master on.
	2 VHFs	On.
	2 NAVs	DME.
	2 ADFs	ADF.
	Markers	Lo.
	Transponder	Standby.
	Autopilot master	On.
	Autothrottle master	On (if fitted).
	Radio cooling fan	Test both (lamp out)
18.	Gear selector	Down, 6 greens. Check 6 green filaments.
19.	Free fall lever	Down.
20.	Pitot isolate switch	Normal.

PORT INSTRUMENT PANEL

1.	Warning lamps	Test.
2.	Marker lamps	Lo,test.
3.	Clock/Stopwatch	Check. Check fully wound and functioning, check correct time on clock.
4.	Radio altimeter	Test. Press test button and check that both instruments indicate approx 30' (2500ft on 400 series a/c) with fail flags in view. Test the 'Below DH' warning lamp.
5.	Flight instruments	Check. Check instrument condition and serviceability (where appropriate), compass synchronised - check against E2B.
6.	Static selectors	Normal.
7.	RMI mode switch	Slaved HDG.

CENTRE INSTRUMENT PANEL

1.	Warning lamps	Test. While checking the panel, test the following lamps: hydraulic, reverser unlocked, oil LP, firebell isolation, flap shaft fail, mach trim, auto trim and cabin altitude.
2.	Standby horizon	Erect, flag clear.

3.	Fuel gauges	Test When the test buttons are pressed the needles move towards zero and return to their original positions when the buttons are released.
4.	Hydraulics panel	Check.
	System quantities	Both top of green sector
	Warning lamps	Test
	Engine pump switches	On
	Engine pump fail lamps	Illuminated
	Aux pump switches	Off
	Power valve indicators	In line
	Spoiler switches	On
	DC pump	Test (Hold the switch to 'Brake ACC' position and note rise in brake acc pressure and rise in TRU amps).
5.	Engine fire warnings	Test.
	For each engine, to test the integrity of the Zone 1 firewire:	
	Test switch	Press
	Firebell	Check
	Fire control handle	Illuminated (2 filaments)
6.	Engine overheat	Test-reset.
	For each engine, to test the integrity of the LP cooling air overheat circuit:	
	Overheat lamp	Press
	Overheat lamp	Illuminated
	Reset switch	Press
	For each engine, to test the integrity of the Zone 2 firewire:	
	Zone 2 test switch	Press
	Overheat lamps	Illuminated
7.	Vibration indicators	Test (if fitted or, 400 series only, if fitted and active).
	Test buttons	Push
	Indicators	3.5 relative amplitude
	Warning lamps	Illuminated
8.	Engine instruments	Check.
9.	Anti-skid	On-Test-Off.
	Anti-skid	Select On
	Test switch	Up, and release
	Inner Amber lamps / Rel Indicators	Illuminate briefly
	Test switch	Down, and release
	Outer Amber lamps / Rel Indicators	Illuminate briefly
	Anti-skid	Select Off
10.	TAT gauge	Check.
11.	Gear horn	Test.
12.	Ram air valve	Closed.
13.	Safety valve	Open.

14.	Cabin selector	Set.
	Planned cruise level	Above FL180: Set 1013 on millibar scale, and the cabin altitude corresponding to the cruise level under the pointer.
	Planned cruise level	FL180 or below: Set QNH on millibar scale, and the airfield elevation +500ft under the pointer.
15.	Fuel totalisers (if fitted)	Zero.

STARBOARD INSTRUMENT PANEL

1.	Warning lamps	Test.
2.	Marker lamps	Test.
3.	Flight instruments As port panel	Check.
4.	Clock/stopwatch As port panel	Check.
5.	Static selectors	Normal.
6.	RMI mode switch	Slaved HDG.

STARBOARD CONSOLE

1.	Stall rec pressures	HP 500 min, LP green.
2.	Oxygen system	Check.
	Supply valves	Fully open.
	Contents	Normal:- 1500 Quick Don Sierra 1000 Drop Down (See page 2-1-iii for min acceptable).
	Pax supply valve (if fitted)	Fully off.
	Therapeutic supply knob (if fitted)	Press in

ROOF PANEL

1.	APU	Start, if not running.
	See Flight Deck Preliminaries.	
2.	High speed warnings	Test.
	Push then pull switch	Check both bells.
3.	Stall protection system	Check (aux pump reqd).
	Stall Rec pressures HP -	500 psi min LP - Green sector (55-59 psi).
	Stick push dump lever	In.
	No. 2 aux pump	On, lamp out, 2850 psi min.
	No.1 Stall warn test s/w	Hold on, check stick shaker
	No.1 Stall Rec test s/w	On, check horn sounds, stick push operates, stall Rec Op lamps (2)and Valve Open lamps (2) all illuminate.
	No.2 Stall warn test s/w	Hold on, check stick shaker
	No.2 Stall Rec test s/w	On, check horn sounds, stick push operates, stall Rec Op lamps (2) and Valve Open lamps (2) all illuminate.
	No.1 Stall Rec test s/w	On, check 3 fail lamps illuminated with no warning horn, stick shake or push.
	No.2 Stall Rec test s/w	On, check 3 fail lamps illuminated with no warning horn, stick shake or push.
	LP warning lamp	Test.
	No.1 Auto-Ign test s/w	On, check lamps, release.
	No.2 Auto-Ign test s/w	On, check lamps, release.
	No.2 aux pump	Off.

NOTE - If a stall warning or recognition system is known or found to be unserviceable, this check must be completed prior to each take-off to ensure that at least one stall warning and one stall recognition system remain serviceable. Unless either No.1 or No.2 stall warning **and** stall protection systems are both serviceable, the warning horn will not sound. The Stall Warn and Stall Rec Test switches additionally provide a functional test facility for those oleo-operated relays which isolate the Stall Warning and Recovery system on the ground; the test switches will only function with those relays in the 'Ground' condition. If either stick shake or stick push fails to operate when the appropriate test switch is held on, the failure may be caused by a malfunctioning oleo relay.

4.	Electrics panel	Check.
	CSD disconnect switches	Normal (guards closed).
	Freq/Volt selector	APU GEN.
	AC volts/freq, KVA	Check.
	Warning lamps	Test.
	TRU amps	Check.
	DC fail lamp	Out.
	DC volts/Batt amps	Check.
5.	Pitot heaters	On-check-Off.
	Pitot heat switches	On (5)
	Ammeter readings	Check (5)
	Stall vane heaters lamps	Out (4)
	Pitot Heat switches	Off
6.	Fuel panel	Check.
	If fitted	
	Transfer pumps	Off
	Transfer cocks	Closed, indicator cross-line
	Transfer LP lamp	Test
	LP Valve switches	Open, indicators in-line. If necessary momentarily move the HP Cocks to Start, and check that the indicators show in-line.
	Crossfeed cock	Open, check indicator in-line, Close. check indicator cross-line.
	Booster pumps	Test, off. Each pump in turn: Switch on, check lamp out, select off.
	Warning lamps	Test.
7.	Engine start panel	Check.
	LP shaft lamp	Test
	Start Master	Off
	Start/Relight switches	Off
8.	Air system panel	Check.
	Fuse duct test button	Press, check System Fail lamps illuminate. This confirms that the fuselage ducting overheat thermostats are serviceable
	Isolation valves	Closed.
	Stub duct test buttons	Press in turn, check system fail lamps illuminate. This confirms that the stub wing overheat thermostats are serviceable. Operate the reset buttons to extinguish lights.
	Master valve lamps	Test.
	Fan MI (if fitted)	Check green.
	Air crossfeed valve	Close.

	APU air delivery valve	Open, No.1 system press 30-40 psi.
	No.1 master valve	APU, check that air is available at louvre and then close. Check that the airflow ceases.
	Air crossfeed valve	Open, system pressure 30-40 psi.
	No.2 master valve	APU, check that air is available at the louvre.
	Temperature controls	Set, select No.1 Off, No.2 auto.
9.	Door Warning Lamps	Press the test button to check warning lamps.
10.	Lower panel	Check.
	Turn-off lights	Off
	Landing lamps	Retract, Off
	Windscreen heat	Low
	Side window heat	On
	Windscreen heat lamps	Test
	Airframe anticing	Select each airframe antice switch in turn to 'Test' and observe the drop in mains air pressure or check dolls eye (if fitted) indicate ON. This test should be of minimum duration (max. 10 secs) to avoid heating wing/tail surfaces. If the APU is unserviceable, this check must be performed when taxying (with master valves at 'Open' or 'Close'). Ensure that the mains air pressure is restored at the end of the test (to ensure that a valve has not stuck open).
	Ice warn lamp	Check. The ice warning lamp should be illuminated following the external check of the ice detector. Select both engine antice switches to On then Off to extinguish the lamp.
	Exterior lights	As required.
	Cabin notices	On.
	Emerg lights	Arm.

CONTROL PEDESTAL

1.	Trimmers	Rudder and aileron zero.
2.	Hydraulic cut off levers	Off-test-on-test.
	No.1 cut off lever	Off, indicator cross-line
	No.2 cut off lever	Off, indicator cross-line
	Servo fail lamp button	Press, check red lamps in the heads of the levers illuminate (double filament).
	No.1 cut off lever	On, indicator in-line
	No.2 cut off lever	On, indicator in-line
	Servo fail lamp button	Press, check red lamps in the heads of the levers do not illuminate.
3.	Elevator emergency	Check.
	Elevator emergency lamps	Test. Amber lamp indicates loss of system pressure. Red lamp indicates stuck elevator PCU.
	Elevator emergency s/w	Emergency.
	Green lamp (if fitted)	Check on.
	Elevator operation	Check (180kt feel). (400 series a/c - 150kt feel)
	Elevator emergency s/w	Off.
	Warning lamps	Check out.
4.	Throttles	TCW check.
	No.1 throttle	Advance to approximately mid position on the throttle quadrant to check the TCW (intermittent horn) operates.
	No.2 throttle	Advance to approximately mid position on the throttle quadrant to check the TCW (intermittent horn) operates.
5.	Flaps	Up, check indicator.
6.	Mach trim switch	On.
7.	TTC switches	TTC only.
8.	Windscreen wipers	Off.
9.	HP cocks	Shut.
10.	Autopilot	Check (aux pump reqd).
	No.2 aux pump	On, lamp out, 2850 psi min.
	Trim indicators	In line.
	Turn control	Centre detent.
	Flying Controls	Centralise.
	Autopilot	Engage.
	Flying controls	Check resistance to control movement, trim indices move within limits.
	Pitch control wheel	Rotate toward Up, check correct sense column and trim wheel movement, repeat with rotation toward Down. Centralise.

Port cut-out button	Press, check audio warning, check disengagement, engage switch released, control movement not resisted.
Autopilot	Re-engage.
Stbd cut-out button	Press and check as above.
Autopilot	Re-engage.
Autopilot master switch	Off, check disengagement, On.
Autopilot	Re-engage.
Autopilot break-out	Check. Push the control column forward, hold for approx 5 sec, pull back quickly. About 2 inches of movement are normally required. The audio warning will continue until either cut-out button is pressed. Repeat if disconnect is not achieved.
11. Autothrottle	Check.
Speed engage switch	Engage
Left disengage button	Press
Speed engage switch	Engage. Select off. Check lights flash
Right disengage button	Press, check lights out
Speed engage switch	Engage
Autothrottle master s/w	Select Off, check mode indicator light flash. Press disengage button
Autothrottle master s/w	On

12.	Flying controls	Check (aux pumps reqd).
	No.2 aux pump	On, lamp out, 2850 psi min.
	Tailplane trim	Fully nose-up, back to 3° nose-up.
	Elevator	Check operation, feel, centring.
	Rudder	Check operation, feel, centring and feel fail lamp On (see note below).
	No.2 aux pump	Off, dissipate system pressure.
	No.1 aux pump	On, lamp out, 2850 psi min.
	Tailplane trim	Fully nose-down, set 3° nose-up check indicator.
	Elevator	Check operation, feel, centring.
	Rudder	Hold tiller firmly. Check operation, feel, centring and feel fail lamp On (see note below).
	No.1 aux pump	Off, dissipate system press.
	Gust damper lamp	On.

NOTE - If the feel fail lamp fails to come on, then after engine starting:-

i)	Hydraulic cut-off lever	Off (system which was unpressurised). Dissipate trapped system pressure with rudder movement.
ii)	Feel fail lamp	Check On.
iii)	Hydraulic cut-off lever	On.
13.	Aux pumps	Off.
14.	Elevator trim switches	Test. Operate both switches to move elevator trim tab from fully nose up to fully nose down and back to zero, checking the trim indicator.

15. Radios		Check.
Markers		Select to LO.
Cabin Address and Evacuation Alarm (where fitted)		Provided there are no passengers on the aircraft make the following announcement on the PA: **"FLight deck to cabin crew, this is an evacuation alarm test, repeat test only".** Raise the guard and activate the evacuation alarm switch. Check the flight deck aural warning and illumination of the red LED. After the cabin crew have reported the cabin units serviceable select the switch to off and close the guard. If there are passengers on the aircraft this check may be left until the next suitable opportunity.
Comms		Test each Transmitter/Receiver on local frequency designated for testing.
Navigation	ILS	Select ILS frequency on both, check ident, check displays on both Course Indicators using transfer switch.
	VOR	Select local VOR frequency - check displays. Set RMI to VOR and check bearing pointers. If local station not receivable use NAV test switch as detailed in FCS & RADIO.
	DME	Switch on DME check readouts on local station if possible or use NAV test switch (if fitted) as detailed in FCS & RADIO.
	ADF	Function switch of each ADF controller to ADF. Select local beacon frequency and check ident. Select ADF inputs to RMI and check bearing pointers.
Transponder		Select System 1 or 2. Press Test momentarily, check green lamp comes on. Select other system and repeat Test. Select Standby.

	NOTE: - None of the other switches need be operated.
GPWS	Press either GPWS test lamp, if system serviceable both lights flash and audio warning is given at reduced volume.
Weather Radar	Test as detailed in FCS & RADIO.
CVR	Press Test button for 5 seconds, the meter should read in the "GOOD" sector whilst the button is depressed if all four channels are serviceable.

EXTERNAL

Prior to each flight a pilot shall check:-

Ice, snow and hoar frost	Aircraft clear or within limits.
Pitot heads, ice detectors and stall protection sensors	Clear and free from damage, covers removed.
Ice detector	Check operation prior to the first flight of the day and prior to each night flight.
Static vent plates	Clear and free from damage.
Aerials	Intact.
Navigation, beacon, turn-off and landing lamps, ice observation lamps.	Check prior to the first flight of the day and prior to each night flight.
Gear, wheels, tyres	Condition, ground locks removed.
Flying controls	Unobstructed and free from damage.
Doors and access panels	Secured, if not in use.

Aeroplane free from damage and fluid leakage. Particular attention should be paid to the forward toilet servicing and forward water charging points, where fitted. Any leakage from these points is unacceptable and must be brought to the attention of Engineering, who should, before flight either:-

1. Replace any defective components and re-check for leaks.

or

2. Drain and lock-out the forward toilet/forward water tank as appropriate.

TURNROUNDS

Battery	**On**	
Firebottle ind	**Amber**	Check that the firebottle discharge indicators are amber.
APU	**Start**	See Full Checks. If ground power is available and air conditioning is not required delay the start of the APU until the Pre-start checks.
Anticing	**Reset**	Check that the windscreen and side window heat switches are low/on, airframe and engine anticing switches off and the ice warning light is pushed in and extinguished.
Cabin signs	**On**	
Emergency lights	**Arm**	
Radio cooling fan	**Alternative position**	
Hydraulic panel	**Check**	Check that the quantity gauges indicate top of the green sector, EDP switches are On and aux pumps are Off.
Engine Overheats	**Test**	See Full Checks.
Fire warnings	**Test**	See Full Checks.
Gear selector	**6 greens**	Check 6 greens filaments.
Cabin selector	**Set**	See Full Checks.
Fuel totalisers	**Zero**	
Throttles	**TCW check**	See Full Checks.
TTC switches	**TTC only**	
Scan	**Completed**	Ensure that all switches and levers are in their correct positions for departure.
System checks	**If req'd**	If there are any known deficiencies with the stall protection system, flying controls, autopilot or air systems carry out the relevant system checks.

PRE-STARTS

BRIEFING--Emergencies, emergency turn, Ha. Runway state, precipitation precautions. Initial terrain. SID. Transition altitude. Noise abatement. Radio aids. FCS.		See Operating Policy, Crew Briefing for full requirement. Set altimeter bugs at airfield elevation + 500ft (for noise abatement) and Ha. See FCS procedure.
Altimeters	**QNH**	See Operating Policy, Altimeter Setting.
Locks	**Stowed**	
Flight recorder	**Date, no**	Select date, month and flight number. Press 'Insert Ident'.
Oxygen	**Check**	A/c with drop down oxygen - Check contents. Check pax supply closed and crew supply open. A/c with quick don masks - Check that the supply switch is on, select 100% and check that the emergency switch is off. Check mask adjustment.
Handbrake	**On, 2800, temps**	
APU	**Gen and air on**	See Full Checks.
Dump valve	**Shut, ind open**	Push dump valve control down, check fully anticlockwise and indicator shows open.
Tech Log	**Signed**	
Ships papers	**Signed**	
Take-off thrust	**Set**	Extract and set the take-off thrust index to be used.
V_1 V_R V_2 V_{FU} V_{MO} TPI	**Set & checked**	Set integral ASI indices to V_2, and outer bugs to V_1 and V_{FU}. Confirm V_R and V_{MO}. Switch On No.2 aux pump and set TPI. Switch Off pump.
Flt rec (539 & 400 only)	**T/O weight**	On 539 & 400 series a/c, set the first three numbers of the take-off weight in the first three spaces of date/month. Press 'Insert Ident'.
Door lamps	**Checked**	For push and start all lamps must be out. For start only the rear cargo and ventral lamps must be out.

START

Beacon	**On**

ENGINE START

Hydraulic pumps	Off.
Master valves	Closed.
Isolation valves	1 closed, 2 open.
Eng.2 booster pump	Rear On (400 series a/c -both on).
Frequency/Volt selector	Essential.
Start master switch	Start.
Engine 2 start/relight switch	Start (2 secs).
Igniter lamps	Check on.
Master warning lamps	Arm.
LP shaft lamp	On.
* If OAT is 15°C or more:	
HP cock lever	Open at 14% HP rpm.
If OAT is below 15°C:	
HP cock lever	Start at 14% HP rpm.
HP cock lever	Open when TGT passes 500°C (400°C for 400 series a/c) or stabilises or at 40% HP rpm. Check start cycle cancelled (LP and igniter lamps out).
No.2 hydraulic EDP	On.
Engine instruments	Check, warning lamps out.
No.1 isolation valve	Open.
Air crossfeed valve	Closed.
Eng.1 booster pump	Rear On (400 series a/c - both on).
Engine 1 start/relight switch	Start (2 secs).

PROCEDURE AS FOR No.2 ENGINE

Start master switch	Off. Check start cycle cancelled (LP and igniter lamps out).
Engine instruments	Check, warning lamps out.

NOTE - The HP cocks may only be returned to the start position once the start cycle has been cancelled, and the start lamps extinguished. This action may be used to overcome a hung start (i.e. when the engine fails to accelerate to idle rpm).

* **NOTE** - After short turnrounds or due to tech log history, this procedure may used at lower OAT's.

Start master	**Off**	
Air conditioning	**Set**	Air crossfeed valve Open. Master valve switches APU. Temperature controls Auto.
Engine antice	**As req'd**	On if OAT below +10°C and a) visibility below 1000m, or b) runway is wet, or c) icing conditions present.
Electrics panel	**Check**	Check generator 1 and 2 frequency and volts. Set frequency/volt selector to essential. Check warning lamps out and DC volts approximately 28. Check KVA and TRU and battery amps.
Pitot heaters	**On**	Heater fail lamps (4) On. Pitot heater switches (5) On. Pitot ammeters (5) Check. Heater fail lamps (4) Out.
Doors	**Lights out**	Check all door warning lamps by pressing the test button.
Windows	**Checked closed**	
Flt recorder	**Start**	
Power fail w/lt	**Out**	(if fitted)
ENGINEER'S CLEARANCE.		**Ensure that the engineer is clear of the a/c before continuing.**
Hydraulics	**EDPs on**	No.2 EDP Check on. check pressure, lamp out. No.1 EDP On. check pressure, lamp out.
Safety valve	**Closed**	
Warning lamps	**Out**	
Footbrakes	**Checked**	Apply footbrakes at both pilot positions and check pressures indicated on the footbrake pressure gauge.

TAXYING

Speedbrake	**Check 1st flt**	Collar Up. Speedbrake lever Fully aft. Lift dump MI's 'OUT'. Speedbrake lever Fully fwd. Lift dump MI's Blank.
Flap	**Select**	
TPI & trims	**Set & zero**	Tailplane Set. Rudder/aileron trims Zero. Elevator trim tab Zero.
Flight instruments	**Check**	A check during a turn in one direction only is required, e.g.: During a right turn: 'Turning right, skidding left, three horizons remaining steady, compasses (5) increasing through (heading) degrees, steady and rational bearings on the RMI's.' When the turn is complete: 'Compasses steady on (heading) degrees.'
Reverse thrust	**Check 1st flt**	This check may be omitted if reverse thrust has been satisfactory on the previous flight that day. Throttles Reverse Idle. Reverser unlocked lamps On. Throttles Forward Idle. Reverser unlocked lamps Out.
Flying controls	**Check**	The non handling pilot checks unrestricted operation of the ailerons and elevator and the handling pilot checks the rudder.
Loadsheet/Configuration	**Handling pilot check**	The handling pilot will check that, if Late Close Out Procedure is being used, the final loadsheet figures have been received and actioned. The handling pilot will check the required flap setting, flap lever position, achieved flap setting, the tailplane is set and elevator trim is zero.
Cabin report	**Received**	
ATC clearance	**Received**	Altitude Alert As Required

ENTERING RUNWAY

Vital data,anticing.	Check still applic.	Re-assess surface conditions for take-off and, if necessary, adjust vital data.
Booster pumps	All on	
Cabin crew	Signal	Flash seat belt sign.
No.1 aux pump	On	
Anti-skid	On, brake temps	If temperature is above 200°C refer to Gear Limitations.
Transponder	On	
Relights	As required	

From memory AFTER TAKE-OFF

Gear	Up, lts out	Check/select lamps to Bright.
Landing lts	Retract. off	
Air conditioning	Set	No.2 master valve Open. Pause 2-3 seconds No.1 master valve Open. Pause 2-3 seconds Air cross-feed valve Closed. Air delivery valve Closed.
Start/relights	Off	
Anticing	As required	If required: Engine antice Check on. Wing antice On. Tail antice On. If not required: All anticing Off.
No.1 aux pump	Off	
Flaps	Zero	
Cabin notices	As req'd	

CLIMB

Pressurisation	Check	
APU	Off (unless ess.)	
Speedbrake	Collar down	
TTC switches	Arm	TTC switch No.1 Arm. Check power. Pause TTC switch No.2 Arm. Check power.
Altimeters	1013 when cleared	
Fuel transfer (400)	As req'd	Transfer pumps On Transfer cocks Open

DESCENT

Vital data/briefing	**Confirmed**	Briefing will have been completed before descent. Refer to Operating Policy, Briefing. ASI bugs V_{AT}, V_{AT}+10, V_{FU}. Servo alt bugs DH, DH+100 ft. Radio alt bugs DH (if req'd).
Standby altimeter	**QNH**	
Cabin selector	**Set**	Set QNH on millibar scale, and the airfield elevation +500 ft under the pointer. **Note:** If:- 1. The cooling fan is U/S, **or** 2. The APU is U/S **and** a) the surface temp is above 25°C, **or** b) the aerodrome elevation is above 2200ft (OLE), 950ft (NLE) set the aerodrome elevation +1500ft under the pointer.
Fuel contents	**Check**	Compare fuel contents with minimum diversion fuel requirement. Booster pumps All on. Crossfeed cock Shut.
Rad alt, autoflare, IFM	**Check if req'd**	Check if planning a Cat 2/3 or autoland. See B1-11 FCS Procs 1-7-2.

APPROACH

Altimeters	**QNH**	
Speedbrake	**Collar up**	
No.1 aux pump	**On**	
TTC switches	**TTC only**	
APU	**As required (25°/2200'/950')**	Start the APU if: Surface temp above 25°C. or, the aerodrome elevation is above 2200ft (OLE), 950ft (NLE).
Cabin notices	**On**	
FCS	**Set for approach**	See FCS Procedures.

LANDING

Gear	**Down, 3 greens**	Select 'Bright' to confirm 3 greens and no red lamp. Select 'Dim' if necessary.
Altimeters	**QFE**	
Brakes	**Pressures zero, accs 2800, anti-skid On**	
Radar	**Standby**	
Anticing, relights	**Set**	At 1500ft: Tail anticing Off. Wing anticing Off. Engine anticing As required. On if OAT below +10°C **and** a) visibility below 1000m, **or** b) runway is wet, **or** c) icing conditions present. Start/relights As req'd. On if RWY wet or contaminated with snow/slush or there is precipitation.
Air conditioning	**Set**	If APU is running: Air delivery valve Open. Air crossfeed valve Open. No.1 master valve APU. No.2 master valve APU. **Note:** If:- 1. The cooling fan is U/S: **or** 2. If the APU is U/S **and** a) the surface temp is above 25°C, **or** b) the aerodrome elevation is above 2200ft (OLE), 950ft (NLE), to guarantee single engine go-around performance: Air delivery valve Closed. Air crossfeed valve Closed. No.1 master valve APU. No.2 master valve APU.
Cabin crew	**Report, signal**	Flash the Seat Belt sign.
Flaps	**Final setting**	

From memory GO-AROUND

Full power	Set.
Flaps	Select 18° (NLE 20°).
Attitude and speed	Establish and check.
Gear	Select up.
Mode selector	Off.
Altimeters	As required.

GO-AROUND

Altimeters As required

Complete the After Take-off Check.

IF DIVERTING: Continue with Climb Check.

FURTHER APPROACH: Re-check vital data/briefing/fuel & continue with Approach Check.

AFTER LANDING

Anti-skid	Off
Lift dump & flaps	In & up
APU	Start
Pitot heaters	Off
Relight switches	Off
Safety valve & DV window	Open
TPI	+3, check ind
Transponder	Standby
APU	Check
Single engine taxy	As req'd

Provided Reverse Idle has not been exceeded, or two minutes have elapsed since reverse was cancelled:

No.1 aux pump	Check on
No.1 isolation valve	Close
No 1 engine booster pumps	Off
No.1 HP cock	Close
MWS lamp	Cancel
Hydraulic pressures	Check

Set to APU if required

Air conditioning	As Required
Engine antice	Off

Entering Parking Area

Hyds/brake press	Check
Slides	PA/Report

SHUTDOWN

Handbrake	On, 2800psi	
Isolation valves	Closed	
Booster pumps	Off	
Master w/lt	Cancel	
HP cocks	Shut	
Beacon, seat belt	Off	
Landing & Turn-off lts	Off	
No.1 aux pump	Off	
Hydraulics	Contents	
Flight rec	Off	
Air cond	As req'd	
Oxygen system	Contents	
DV windows	Locked	
Roof panels	Dimmers off	
Handbrake	Off, when chocked	
Gust damper light	On	
Emergency lights	Off	Switch off Emergency lights when the passengers have disembarked and at least 30secs before power is removed from the a/c.
APU	As req'd	Wait at least one minute after switching off the air del valve before shutting down.
Battery	Off if APU off	
Fan intake shutter	Auto	
Tech log	Complete	

FULL SHUTDOWN

Air conditioning	Off
Screen heats	Off
Radars	Off
A/pilot, A/throt, radios	Off
APU	Off unless req'd
Battery	Off if APU off

CONTENTS

FULL CHECKS 1-6-1
  Flight Deck Preliminaries
  Port instrument panel
  Centre instrument panel
  Starboard instrument panel
  Starboard console
  Roof panel
  Control pedestal

EXTERNAL 1-6-14

TURNROUNDS 1-6-15

PRE-STARTS 1-6-16

START 1-6-17

TAXYING 1-6-19

ENTERING RUNWAY 1-6-20

AFTER TAKE-OFF 1-6-20

CLIMB 1-6-20

DESCENT 1-6-21

APPROACH 1-6-21

LANDING 1-6-22

GO-AROUND 1-6-23

AFTER LANDING 1-6-23

SHUTDOWN 1-6-24

FULL SHUTDOWN 1-6-24

S1-11 AMPLIFIED CHECKLIST

NOTES

1. Do not move any control lever which is apparently out of position without first checking with Engineers.
2. The Full Checks are presented in a form to permit an orderly scan of the panels.
3. The requirement to 'test' some warning lamps which will be illuminated is to ensure that they are pushed in and not isolated from the MWS.

FULL CHECKS

Flight Deck Preliminaries

1.	Battery/Essential AC	Check.
	Air Conditioning	Off. Master valves closed, air del and X-feed closed, cooling fan isolated. This is to prevent air conditioning overheat when power is removed from the cooling fan.
	Battery switch	On.
	APU/GPU	Trip.
	DC fail lamp	On. Shows that the main DC busbar is isolated from the essential DC busbar).
	Battery lamp	Out (test). Shows that the battery and essential DC busbars are connected.
	Essential AC	115v/400 cps.
	Battery voltage	23 volts minimum. Press battery volts button to check a minimum 23 volts under the load of the inverter.
	Normal electrics	Restore if GPU available or APU running.
	Air conditioning	Restore if APU running (see below).

2.	Fire control handles	In.
3.	Firebottle discharge inds	Amber.
4.	APU	Start, if GPU unavailable or air conditioning required.
	Fire switch	Manual.
	Fire handle	In.
	Fire warning	Test.
	Oil LP lamp	Test.
	Check clear for start up.	
	Start master	APU.
	Control switch	On, check fuel valve open.
	Start button	Push (2 seconds).
	EGT	Check
	Indicator	'START', 'blank' then 'RUN'.
	Oil LP lamp	Out.
	EGT	Monitor.
	Start Master	Off, within one minute.
	Fire switch	Auto.
	Generator	Check (APU generator fail lamp out, 115v/400cps).
	Air conditioning	May be introduced one minute after APU start.
	Cooling fan switch	Normal.
	Air delivery valve	Open.
	Air crossfeed valve	Open.
	No.2 master valve	APU.
	No.2 temp control	Auto.
5.	Exterior lights	On. (Ice insp, nav, beacon, wheelwell, turn-off.)
6.	Nosewheel visual ind	Green, full disc. (Requires wheelwell light on.)
7.	Aircraft documents	Check. Check the Weight and CG balance extract.
8.	Pressurisation amplifier lamp	Out. If illuminated the adjacent Ground Test/Flight switch has been left at 'Ground' and the diff pressure will rise rapidly when the last a/c door or window is closed.
9.	Power failure lamp	Test. This will be On if GPU is powering electrical system, Out if APU is on line.
10.	Cb's	Check set.

11. Aircraft library — Check.
    - Weight Schedule
    - Quick Reference Handbook (2 copies)
    - Checklist (2 copies)
    - Reference Speeds Booklet
    - Performance Manual
    - Charts Wallet
    - Flying Manual
    - Technical manual
    - Flight Crew Orders
    - FODN's and FCN's
    - Load and Balance Manual
    - Allowable Deficiencies
    - Aerad Supplement
    - AWO Report Forms Pad
    - Spare forms wallet
    - IATA Handbook of Restricted Articles
    - Fuse and cb location card
    - Cabin Crew Manual
    - Cabin Crew SEP Manual
    - Certificates file containing:
        - Certificate of Airworthiness
        - Certificate of Registration
        - Noise Certificate
        - Aircraft Radio Licence
        - Certificate of Approval of A/c Radio Installations
        - Certificate of Insurance
    - Back-up Manuals (2 copies of each)
    - Diversion Diagram Manual
    - Emergency Airfields Manual
    - Route Briefing Manual
    - Topographical map.

12. Spare headset — Stowed.
13. Cooling fan switch — Normal, shutters auto.
14. Emergency equipment — Check.
    - 3 crew lifejackets.
    - 2 smoke masks.
    - 1 pair of smoke goggles.
    - 2 MSA smoke hoods.
    - Fixed oxygen system.
    - 1 BCF extinguisher.
    - 2 escape ropes.
    - 1 fireaxe.
    - 1 Passenger restraint pack.

15.	Standby steering	Off, test lamp. If lamp is illuminated, the standby steering accumulator pressure has fallen below 2000 psi. Do not pressurise No. 1 system without engineering clearance.
16.	Radar, radios, fans, a/pilot,	
	Radar	Standby, master on.
	2 VHFs	On.
	2 NAVs	DME.
	2 ADFs	ADF.
	Transponder	Standby.
	Autopilot master	On.
	Autothrottle master	On.
	Radio cooling fan	Test both (lamp out)
17.	Gear selector	Down, 6 greens. Check 6 green filaments.
18.	Free fall lever	Down.
19.	Pitot isolate switch	Normal.
20.	Flight systems gyro switch	On.

PORT INSTRUMENT PANEL

1.	Warning lamps	Test.
2.	Marker lamps	Lo, test.
3.	Clock/Stopwatch	Check. Check fully wound and functioning.
4.	Radio altimeter	Test. Press test button and check that both instruments indicate approx 30'with fail flags in view. Test the 'Below DH' warning lamp.
5.	Flight instruments	Check. Check instrument condition and serviceability (where appropriate), compass synchronised - check against E2B.
6.	Static selectors	Normal.

CENTRE INSTRUMENT PANEL

1.	Warning lamps	Test. While checking the panel, test the following lamps: reverser unlocked, oil LP, firebell isolation, flap shaft fail, mach trim, auto trim and cabin altitude.
2.	TAT gauge	Check.
3.	Fuel totalisers	Zero.
4.	Engine overheat	Test-reset.
	For each engine, to test the integrity of the LP cooling air overheat circuit:	
	Overheat lamp	Press
	Overheat lamp	Illuminated
	Reset switch	Press
	For each engine, to test the integrity of the Zone 2 firewire:	
	Zone 2 test switch	Press
	Overheat lamps	Illuminated
5.	Engine instruments	Check.
6.	Vibration indicators	Test.
	Test buttons	Push
	Indicators	Between 6 and 8 relative amplitude
7.	Anti-skid	On-Test-Off.
	Anti-skid	Select On
	Test switch	Up, and release
	Inner Rel Indicators	Illuminate briefly
	Test switch	Down, and release
	Outer Rel Indicators	Illuminate briefly
	Anti-skid	Select Off
8.	Engine fire warnings	Test.
	For each engine, to test the integrity of the Zone 1 firewire:	
	Test switch	Press
	Firebell	Check
	Fire control handle	Illuminated (2 filaments)
9.	Gear horn	Test.
10.	Cabin selector	Set.
	Planned cruise level	Above FL180: Set 1013 on millibar scale, and the cabin altitude corresponding to the cruise level under the pointer. Planned cruise level FL180 or below: Set QNH on millibar and the airfield elevation +500ft under the pointer.

STARBOARD INSTRUMENT PANEL

1.	Warning lamps	Test.
2.	Marker lamps	Lo, test.
3.	Flight instruments As port panel	Check.
4.	Clock/stopwatch	Check. Check fully wound and functioning. Check correct time on clock.
5.	Static selectors	Normal.

STARBOARD CONSOLE

1.	Stall rec pressures	HP 500 min, LP green.
2.	Oxygen system	Check.
	Contents	Minimum 3/4 full
	Oxygen supply valve	Fully open, pressure in 'normal' green sector.
	Pax supply valve	Fully off.

ROOF PANEL

1.	APU	Start, if not running.
	See Flight Deck Preliminaries.	
2.	High speed warnings	Test.
	Push then pull switch	Check both bells.
3.	Stall protection system	Check (aux pump reqd).
	Stall Rec pressures HP -	500 psi min LP - Green sector (55-59 psi).
	Stick push dump lever	In.
	No. 2 aux pump	On, lamp out, 2850 psi min.
	No.1 Stall warn test s/w	Hold on, check stick shaker
	No.1 Stall Rec test s/w	On, check horn sounds, stick push operates, stall Rec Op lamps (2) and Valve Open lamps (2) all illuminate.
	No.2 Stall warn test s/w	Hold on, check stick shaker
	No.2 Stall Rec test s/w	On, check horn sounds, stick push operates, stall Rec Op lamps (2) and Valve Open lamps (2) all illuminate.
	No.1 Stall Rec test s/w	On, check 3 fail lamps illuminated with no warning horn, stick shake or push.
	No.2 Stall Rec test s/w	On, check 3 fail lamps illuminated with no warning horn, stick shake or push.
	LP warning lamp	Test.
	No.1 Auto-Ign test s/w	On, check lamps, release.
	No.2 Auto-Ign test s/w	On, check lamps, release.
	No.2 aux pump	Off.

NOTE - If a stall warning or recognition system is known or found to be unserviceable, this check must be completed prior to each take-off to ensure that at least one stall warning and one stall recognition system remain serviceable. Unless either No.1 or No.2 stall warning **and** stall protection systems are both serviceable, the warning horn will not sound. The Stall Warn an Stall Rec Test switches additionally provide a functional test facility for those oleo-operated relays which isolate the Stall Warning and Recovery system on the ground; the test switches will only function with those relays in the 'Ground' condition. If either stick shake or stick push fails to operate when the appropriate test switch is held on, the failure may be caused by a malfunctioning oleo relay.

4.	Door Warning Lamps	Press the test button to check warning lamps.

5.	Electrics panel	Check.
	CSD disconnect switches	Normal (guards closed).
	Freq/Volt selector	APU GEN.
	AC volts/freq, KVA	Check.
	Warning lamps	Test.
	TRU amps	Check.
	DC fail lamp	Out.
	DC volts/Batt amps	Check.
6.	Pitot heaters	On-check-Off.
	Pitot heat switches	On (5)
	Ammeter readings	Check (5)
	Stall vane heaters lamps	Out (4)
	Pitot Heat switches	Off
7.	Fuel panel	Check.
	Transfer pumps	Off
	Transfer cocks	Closed, indicator cross-line
	Transfer LP lamp	Test
	LP Valve switches	Open, indicators in-line. If necessary momentarily move the HP Cocks to Start, and check that the indicators show in-line.
	Crossfeed cock	Open, check indicator in-line, Close. check indicator cross-line.
	Booster pumps	Test, off.
	Each pump in turn	On, check lamp out, select off.
	Warning lamps	Test.
8.	Engine start panel	Check.
	LP shaft lamp	Test
	Start Master	Off
	Start/Relight switches	Off
9.	Air system panel	Check.
	Fuse duct test button	Press, check System Fail lamps illuminate. This confirms that the fuselage ducting overheat thermostats are serviceable
	Isolation valves	Closed.
	Stub duct test buttons	Press in turn, check system fail lamps illuminate. This confirms that the stub wing overheat thermostats are serviceable. Operate the reset buttons to extinguish lights.
	Master valve lamps	Test.
	Air crossfeed valve	Close.
	APU air delivery valve	Open, No.1 system press 30-40 psi.
	No.1 master valve	APU, check that air is available at louvre and then close. Check that the airflow ceases.

	Air crossfeed valve	Open, system pressure 30-40 psi.
	No.2 master valve	APU, check that air is available at the louvre.
	Temperature controls	Set, select No.1 Off, No.2 auto.
10.	Hydraulics panel	Check.
	System quantities	Both top of green sector
	Warning lamps	Test
	Engine pump switches	On
	Engine pump fail lamps	Illuminated
	Aux pump switches	Off
	Power valve indicators	In line
	Spoiler switches	On
	DC pump	Test (Hold the switch to 'Brake ACC' position and note rise in brake acc pressure and rise in TRU amps).
11.	Lower panel	Check.
	Radio cooling fan	Test both (lamp out)
	Exterior lights	As required
	Emergency lights	Arm
	Intercom switch	Flight
	Cabin notices	On
	Ice warn lamp	Check. The ice warning lamp should be illuminated following the external check of the ice detector. Select both engine antice switches to On then Off to extinguish the lamp.
	Airframe anticing	Select each airframe antice switch in turn to 'Test' and observe the drop in mains air pressure. This test should be of minimum duration (max. 10 secs) to avoid heating wing/tail surfaces. If the APU is unserviceable, this check must be performed when taxying (with master valves at 'Open' or 'Close'). Ensure that the mains air pressure is restored at the end of the test (to ensure that a valve has not stuck open).
	Windscreen heat	Normal
	Side window heat	On
	Windscreen heat lamps	Test
	Turn-off lights	Off
	Landing lamps	Retract, Off

CONTROL PEDESTAL

1.	Trimmers	Rudder and aileron zero.
2.	Hydraulic cut off levers	Off-test-on-test.
	No.1 cut off lever	Off, indicator cross-line
	No.2 cut off lever	Off, indicator cross-line
	Servo fail lamp button	Press, check red lamps in the heads of the levers illuminate (double filament).
	No.1 cut off lever	On, indicator in-line
	No.2 cut off lever	On, indicator in-line
	Servo fail lamp button	Press, check red lamps in the heads of the levers do not illuminate.
3.	Elevator emergency	Check.
	Elevator emergency lamps	Test. Amber lamp indicates loss of system pressure. Red lamp indicates stuck elevator PCU.
	Elevator emergency s/w	Emergency.
	Green lamp	Check on.
	Elevator operation	Check (180kt feel).
	Elevator emergency s/w	Off.
	Warning lamps	Check out.
4.	Throttles	TCW check.
	No.1 throttle	Advance to approximately mid position on the throttle quadrant to check the TCW (intermittent horn) operates.
	No.2 throttle	Advance to approximately mid position on the throttle quadrant to check the TCW (intermittent horn) operates.
5.	Flaps	Up, check indicator.
6.	Mach trim switch	On.
7.	Stick push dump lever	In.
8.	TTC switches	TTC only.
9.	Windscreen wipers	Off.
10.	HP cocks	Shut.

11. Autothrottle	Check.
Speed engage switch	Engage, check 'Throt' on mode indicator
Left disengage button	Press, check mode indicator light out
Speed engage switch	Engage, check 'Throt' on mode indicator. Select off. Check mode indicator lights flash
Right disengage button	Press, check mode indicator light out
Speed engage switch	Engage, check 'Throt' on mode indicator. Autothrottle master s/w, select Off, check mode indicator lights flash. Press disengage button
Autothrottle master s/w	On
12. Autopilot	Check (aux pump reqd).
No.2 aux pump	On, lamp out, 2850 psi min
Trim indicators	In line
Flying Controls	Centralise
Autopilot	Engage
Warning lamps	Test - disconnect lamp, mach trim lamp, auto trim lamp
Land annunciator	Blank
Flying controls	Check resistance to control movement, trim indices move within limits.
Pitch control wheel	Rotate toward Up, check correct sense column and trim wheel movement, repeat with rotation toward Down. Centralise.
Captain's cut-out	Press, check audio warning, check disengagement, engage switch released, control movement not resisted.
Autopilot	Re-engage.
F/O's cut-out	Press and check as above.
Autopilot	Re-engage.
Autopilot master switch	Kill, check disengagement, On
Autopilot	Re-engage.
Autopilot break-out	Check. Push the control column forward, hold for approx 5 sec, pull back quickly. About 2 inches of movement are normally required. The audio warning will continue until either cut-out button is pressed. Repeat if disconnect is not achieved.

13.	Flying controls	Check (aux pumps reqd).
	No.2 aux pump	On, lamp out, 2850 psi min.
	Tailplane trim	Fully nose-up, back to 3° nose up.
	Elevator	Check operation, feel, centering.
	Rudder	Check operation, feel, centering and feel fail lamp On (see note below).
	No.2 aux pump	Off, dissipate system pressure.
	No.1 aux pump	On, lamp out, 2850 psi min.
	Tailplane trim	Fully nose-down, set 3° nose up check indicator.
	Elevator	Check operation, feel, centering.
	Rudder	Hold tiller firmly. Check operation, feel, centering and feel fail lamp On (see note below).
	No.1 aux pump	Off, dissipate system press.
	Gust damper lamp	On.

NOTE - If the feel fail lamp fails to come on, then after engine starting:-

i)	Hydraulic cut-off lever	Off (system which was unpressurised). Dissipate trapped system pressure with rudder movement.
ii)	Feel fail lamp	Check On.
iii)	Hydraulic cut-off lever	On.
14.	Aux pumps	Off.
15.	Elevator trim switches	Test. Operate both switches to move elevator trim tab from fully nose up to fully nose down and back to zero, checking the trim indicator.

14. Radios		Check.
Markers		Select to LO.
Cabin Address and Evacuation Alarm		Provided there are no passengers on the aircraft make the following announcement on the PA: **"FLight deck to cabin crew, this is an evacuation alarm test, repeat test only".** Raise the guard and activate the evacuation alarm switch. Check the flight deck aural warning and illumination of the red LED. After the cabin crew have reported the cabin units serviceable select the switch to off and close the guard. If there are passengers on the aircraft this check may be left until the next suitable opportunity.
Comms		Test each Transmitter/Receiver on local frequency designated for testing.
CCE		Check O/R Norm/Inhibit s/w at Norm Test 'A' and 'B' channels
Navigation	ILS	Select ILS frequency on both, check ident, check displays on both Flight Compasses
	VOR	Select local VOR frequency - check displays. Set RMI to VOR and check bearing pointers. If local station not receivable use NAV test switch as detailed in FCS & RADIO.
	DME	Switch on DME check readouts on local station if possible or use NAV test switch as detailed in FCS & RADIO.
	ADF	Function switch of each ADF controller to ADF. Select local beacon frequency and check ident. Select ADF inputs to RMI and check bearing pointers.
Transponder		Select System 1 or 2. Press Test momentarily, check green lamp comes on. Select other system and

	repeat Test. Select Standby. **NOTE -** None of the other switches need be operated.
GPWS	Press either GPWS test lamp: Both lamps flash and warning "woop woop, pull up, glide slope" at reduced volume.
Weather Radar	Test as detailed in FCS & RADIO.
CVR	Move an HP cock away from the closed position and press Test button for 5 seconds, the meter should read in the "GOOD" sector whilst the button is depressed if all four channels are serviceable.

EXTERNAL

Prior to each flight a pilot shall check:-

Ice, snow and hoar frost	Aircraft clear or within limits.
Pitot heads, ice detectors and stall protection sensors	Clear and free from damage, covers removed.
Ice detector	Check operation prior to the first flight of the day and prior to each night flight.
Static vent plates	Clear and free from damage.
Aerials	Intact.
Navigation, beacon, turn-off and landing lamps, ice observation lamps.	Check prior to the first flight of the day and prior to each night flight.
Gear, wheels, tyres	Condition, ground locks removed.
Flying controls	Unobstructed and free from damage.
Doors and access panels	Secured, if not in use.

Aeroplane free from damage and fluid leaks.

TURNROUNDS

Battery	**On**	
Firebottle inds	**Amber**	Check that the firebottle discharge indicators are amber.
APU	**Start**	See Full Checks. If ground power is available and air conditioning is not required delay the start of the APU until the Pre-start checks.
Anticing	**Reset**	Check that the windscreen and side window heat switches are low/on, airframe and engine anticing switches off and the ice warning light is pushed in and extinguished.
Cabin signs	**On**	
Emergency lights	**Arm**	
Radio cooling fan	**Alternative position**	
Hydraulic panel	**Check**	Check that the quantity gauges indicate top of the green sector, EDP switches are On and aux pumps are Off.
Engine Overheats	**Test**	See Full Checks.
Fire warnings	**Test**	See Full Checks.
Gear selector	**6 greens**	Check 6 greens filaments.
Cabin selector	**Set**	See Full Checks.
Fuel totalisers	**Zero**	
Throttles	**TCW check**	See Full Checks.
TTC switches	**TTC only**	
Scan	**Completed**	Ensure that all switches and levers are in their correct positions for departure.
System checks	**If req'd**	If there are any known deficiencies with the stall protection system, flying controls, autopilot or air systems carry out the relevant system checks.

PRE-STARTS

BRIEFING--Emergencies, emergency turn, Ha. Runway state, precipitation precautions. Initial terrain. SID. Transition altitude. Noise abatement. Radio aids. FCS		See Operating Policy, Crew Briefing for full requirement. Set altimeter bugs at airfield elevation + 500ft (for noise abatement) and Ha. See FCS Procedures.
Altimeters	**QNH**	See Operating Policy, Altimeter Setting.
Locks	**Stowed**	
Flight recorder	**Date, no**	Select date, month and flight number. Press 'Insert Ident'.
Oxygen	**Check**	Check contents. Check pax supply closed, and crew supply open.
Handbrake	**On, 2800, temps**	
APU	**Gen and air on**	See Full Checks.
Dump valve	**Shut, ind open**	Push dump valve control down, check fully anticlockwise and indicator shows open.
Tech Log	**Signed**	
Ships papers	**Signed**	
Take-off thrust	**Set**	Extract and set the take-off thrust index to be used.
V_1 V_R V_2 V_{FU} V_{MO} TPI	**Set & checked**	Set integral ASI indices to V_2, and outer bugs to V_1 and V_{FU}. Confirm V_R and V_{MO}. Switch On No.2 aux pump and set TPI. Switch Off pump.
Flt recorder	**T/O weight**	Set the first three numbers of the take-off weight in the first three spaces of date/month. Press 'Insert Ident'.
Door lamps	**Checked**	For push and start all lamps must be out. For start only the rear cargo and ventral lamps must be out.

START

Beacon	**on**
START ENGINES	
Hydraulic pumps	Off.
Master valves	Closed.
Isolation valves	1 closed, 2 open.
Eng.2 booster pumps	On.
Engine generators	Trip.
Frequency/Volt selector	Essential.
Start master switch	Start.
Engine 2 start/relight switch	Start (2 secs).
Igniter lamps	Check on.
Master warning lamps	Arm.
LP shaft lamp	On.
HP cock lever	Start at 1500 to 1850 HPrpm.
HP cock lever	Open when TGT passes 500°C (or stabilises) or at 5000 HPrpm.
Start master switch	Off at 5000 HPrpm. Check start cycle cancelled (LP shaft and igniter lamps out).
No.2 hydraulic EDP	On.
Engine instruments	Check, warning lamps out.
No.1 isolation valve	Open.
Air crossfeed valve	Closed.
Eng.1 booster pumps	On.
Start master switch	Start.
Engine 1 start/relight switch	Start (2 secs).
Igniter lamps	Check on.
LP shaft lamp	On.
HP cock lever	Start at 1500 to 1850 HPrpm.
HP cock lever	Open when TGT passes 500°C (or stabilises) or at 5000 HPrpm.
Start master switch	Off at 5000 HPrpm. Check start cycle cancelled (LP shaft and igniter lamps out).
Engine instruments	Check, warning lamps out.
Start master switch	Off/engines stabilised.

NOTE The HP cocks may only be returned to the start position once the start cycle has been cancelled, and the start lamps extinguished. This action may be used to overcome a hung start (ie when the engine fails to accelerate to idle rpm).

Start master	**Off**	
Air conditioning	**Set**	Air crossfeed valve Open. Master valve switches APU. Temperature controls Auto.
Safety Valve	**Normal**	
Engine antice	**As req'd**	On if OAT below +10°C and a) visibility below 1000m, or b) runway is wet, or c) icing conditions present.
Electrics panel	**Check**	Set Generators 1 and 2 on-line. Check generator 1 and 2 frequency and volts. Set frequency/volt selector to essential. Check warning lamps out and DC volts approximately 28. Check KVA and TRU and battery amps.
Pitot heaters	**On**	Heater fail lamps (4) On. Pitot heater switches (5) On. Pitot ammeters (5) Check. Heater fail lamps (4) Out.
Doors	**Lights out**	Check all 8 warning lamps by pressing the test button.
Windows	**Checked closed**	
Flt recorder	**Start**	
Standby horizon	**Erect**	Press fast erect button until erect.
Power fail w/lt	**Out**	
ENGINEER'S CLEARANCE.		**Ensure that the engineer is clear of the a/c before continuing.**
Hydraulics	**EDPs on**	No.2 EDP Check on. check pressure, lamp out. No.1 EDP On. check pressure, lamp out.
Warning lights	**Out**	
Footbrakes	**Checked**	Apply footbrakes at both pilot positions and check pressures indicated on the footbrake pressure gauge.

TAXYING

Speedbrake	**Check 1st flt**	Collar Up. Speedbrake lever Fully aft. Lift dump MI's 'OUT'. Speedbrake lever Fully fwd. Lift dump MI's Blank.
Flap	**Select**	
TPI & trims	**Set & zero**	Tailplane Set. Rudder and aileron trims Zero. Elevator trim tab Zero.
Flight instruments	**Check**	A check during a turn in one direction only is required, e.g.: During a right turn: 'Turning right, skidding left, three horizons remaining steady, compasses (5) increasing through (heading) degrees, steady and rational bearings on the RMI's.' When the turn is complete: 'Compasses steady on (heading) degrees.'
Reverse thrust	**Check 1st flt**	This check may be omitted if reverse thrust has been satisfactory on the previous flight that day. Throttles Reverse Idle. Reverser unlocked lamps On. Throttles Forward Idle. Reverser unlocked lamps Out.
Flying controls	**Check**	The non handling pilot checks unrestricted operation of the ailerons and elevator and the handling pilot checks the rudder.
Loadsheet/Configuration	**Handling pilot check**	The handling pilot will check that, if Late Close Out Procedure is being used, the final loadsheet figures have been received and actioned. The handling pilot will check the required flap setting, flap lever position, achieved flap setting, the tailplane setting and elevator trim is zero.
Cabin report	**Received**	
ATC clearance	**Received**	Altitude Alert As Required

ENTERING RUNWAY

Vital data,anticing.	**Check still applic.**	Re-assess surface conditions for take-off and, if necessary, adjust vital data.
Cabin crew	**Signal**	
No.1 aux pump	**On**	
Anti-skid	**On, brake temps**	If temperature is above 200°C refer to Gear Limitations.
Transponder	**On**	
Relights	**As required**	

From memory AFTER TAKE-OFF

Gear	**Up, lts out**	Check/select lamps to Bright.
Landing lts	**Retract, off**	
Air conditioning	**Set**	No.2 master valve Open. Pause 2-3 seconds No.1 master valve Open. Pause 2-3 seconds Air cross-feed valve Closed. Air delivery valve Closed.
Start/relights	**Off**	
Anticing	**As required**	If required: Engine antice Check on. Wing antice On. Tail antice On. If not required: All anticing Off.
No.1 aux pump	**Off**	
Flaps	**Zero**	
Cabin notices	**As req'd**	

CLIMB

Pressurisation	**Check**	
APU	**Off (unless ess.)**	
Speedbrake	**Collar down**	
TTC switches	**Arm**	
Altimeters	**1013 when cleared**	
Fuel transfer	**As req'd**	Transfer pumps On Transfer cocks Open

DESCENT

Vital data/briefing	Confirmed	Briefing will have been completed before descent. Refer to Operating Policy, Briefing. ASI bugs V_{AT}, V_{AT}+10, V_{FU}. Servo alt bugs DH, DH+100 ft. Radio alt bugs DH (if req'd).
Standby altimeter	QNH	
Cabin selector	Set	Set QNH on millibar scale, and the airfield elevation +500 ft under the pointer. **Note:** If:- 1. The cooling fan is U/S, **or** 2. The APU is U/S **and** a) the surface temp is above 25°C, **or** b) the aerodrome elevation is above 2200ft set the aerodrome elevation +1500ft under the pointer.
Fuel contents	Check	Compare fuel contents with minimum diversion fuel requirement. Booster pumps All on. Crossfeed cock Shut.
Rad alt, autoflare, IFM	Check if req'd	Check if planning a Cat 2/3 or autoland. See S1-11 FCS Procs 1-8-3.

APPROACH

Altimeters	QNH	
Speedbrake	Collar up	
TTC switches	TTC only	
No.1 aux pump	On	
APU	As required (25°/2200')	Start the APU if: Surface temp above 25°C. or, elevation above 2200ft.
Cabin notices	On	
FCS	Set for approach	See S1-11 FCS Procs.

LANDING

Gear	**Down, 3 greens**	Select 'Bright' to confirm 3 greens and no red lamp. Select 'Dim' if necessary.
Altimeters	**QFE**	
Brakes	**Pressures zero, accs 2800, anti-skid On**	
Radar	**Standby**	
Anticing, relights	**Set**	At 1500ft: Tail anticing Off. Wing anticing Off. Engine anticing As required. On if OAT below +10°C **and:** a) visibility below 1000m, **or** b) runway is wet, **or** c) icing conditions present. Start/relights As req'd. On if RWY wet or contaminated with snow/slush or there is precipitation..
Air conditioning	**Set**	If APU is running: Air delivery valve Open. Air crossfeed valve Open. No.1 master valve APU. No.2 master valve APU. **Note:** If:- 1. The cooling fan is U/S: **or** 2. If the APU is U/S **and,** a) the surface temp is above 25°C, **or** b) the aerodrome elevation is above 2200ft, to guarantee single engine go-around performance: Air delivery valve Closed. Air crossfeed valve Closed. No.1 master valve APU. No.2 master valve APU.
Cabin crew	**Report, signal**	Flash the Seat Belt sign three times.
Flaps	**Final setting**	

From memory GO-AROUND

Full power	Set
Flaps	Select 18° .
Attitude and speed	Establish and check.
Gear	Select up.
FCS	Steer.
Altimeters	As required.

GO-AROUND

Altimeters As required

Complete the After Take-off Check.

IF DIVERTING: Continue with Climb Check.

FURTHER APPROACH: Re-check vital data/briefing/fuel & continue with Approach Check.

AFTER LANDING

Anti-skid	Off
Lift dump & flaps	In & up
APU	Start
Pitot heaters	Off
Relight switches	Off
Safety valve & DV window	Open
TPI	+3, check ind
Transponder	Standby
APU	Check
Single engine taxy	As req'd

Provided Reverse Idle has not been exceeded, or two minutes have elapsed since reverse was cancelled:

No.1 aux pump	Check on
No.1 isolation valve	Close
No 1 eng booster pumps	Off
No.1 HP cock	Close
MWS lamps	Cancel
Hydraulic pressures	Check

Air conditioning	As required
Engine antice	Off

Set to APU if required.

Entering Parking Area

Hyds/brake press	Check
Slides	PA/Report

SHUTDOWN

Handbrake	On, 2800psi	
Isolation valves	Closed	
Booster pumps	Off	
Master w/lts	Cancel	
HP cocks	Shut	
Beacon, seat belt	Off	
Landing & Turn-off lts	Off	
No.1 aux pump	Off	
Hydraulics	Contents	
Air cond	As req'd	
Oxygen system	Contents	
DV windows	Locked	
Roof panels	Dimmers off	
Handbrake	Off, when chocked	
Gust damper light	On	
Emergency lights	Off	Switch off Emergency lights when the passengers have disembarked and at least 30secs before power is removed from the a/c.
APU	As req'd	Wait at least one minute after switching off the air del valve.
Battery	Off if APU off	
Fan intake shutter	Auto	
Tech log	Complete	

FULL SHUTDOWN

Air conditioning	Off
Screen heats	Off
Radars	Off
A/pilot, A/throt, radios	Off
APU	Off unless req'd
Battery	Off if APU off

TDI

Compass indicator

Course Indicator

B1-11 FCS PROCEDURES

The following recommended procedures are designed to achieve maximum use of the FCS and automatics. The FD must be used (if serviceable)during ILS approaches.

PRE TAKE-OFF SET-UP

To be called out by the handling pilot and actioned by both pilots:

1. Radio Magnetic Direction Indicator

Compass System

Fail flag	Clear
Synchronise	Check against E2B
Course indicator	Check heading
VOR/ADF changeover switches	Set as required

2. Course Indicator

Course control	Set runway QDM/first radial
Heading control	Set runway QDM

3. Flight Director Indicator

Horizon	Erect, flag clear
Pitch command control	Set 15°
Slip indicator	Check
Mode selector	Off
VG changeover switch	Normal
Radio transfer switch	As required
A/P changeover switch	As required
Standby horizon	Erect, flag clear

4. Altitude Alert — As required.

AFTER TAKE-OFF

1.	FDI mode selector	As required
2.	Pitch command control	Adjust for climb attitude

AFTER NOISE ABATEMENT, CLIMB POWER SET

1.	A/P trim indicators	Check in line
2.	A/P engage switch	Engage
3.	Pitch control	Adjust as required
4.	Radio Transfer	As req'd by handling pilot
5.	Course indicator	As required
6.	A/pilot mode selector	HDG or MAN or VOR
7.	Heading selector	Required headings

CRUISE

1.	At cleared altitude/FL	Engage height lock
2.	Power	As required

PRIOR TO DESCENT (AUTOLAND OR CAT 2 MANUAL LANDING)

1.	Autopilot status placards	As appropriate.
2.	Radio Altimeter	Test (**not 400 series**). Press test button and check that both instruments indicate approx 30ft with fail flags in view. Test the 'below DH' warning lamp.
3.	Auto Flare Computer	Test if fitted. Press test button and check cross hatch appears in MI. Release button and check MI returns to black. Must be serviceable if carrying out an autoland.
4.	IFM	Clear, if fitted.
5.	Nav 1, Nav 2, FD, Autopilot	Check serviceability.
6.	Power Fail Warning Lamp	Out, if fitted.

DESCENT

1.	Height Lock	Disengage
2	Pitch control	Pitch down to achieve req'd ROD
3.	Power	As required
4.	At cleared altitude/FL	Engage height lock
5.	Power	As required

HOLDING

1.	Course Control	Reset to holding axis
2.	Heading after 1st turn	QDR ± treble/double drift
3.	Heading after 2nd turn	Intercept and maintain QDM

PRIOR TO APPROACH

1.	Autothrottle (if required)	Check. Select Speed readout - check against P1 ASI. Engage switch - 'Engage', held.

STANDARD ILS APPROACH

1.	Nav receivers	Both to ILS frequency unless VOR radials or DME required. Both sets must be selected to ILS frequency once established and normally by a range of 10-12nm from the RWY threshold.
2.	For LLZ only approach	Inhibit GPWS G/P
3.	Course Control	ILS QDM
4.	Radio Transfer Switch	Normal
5.	Flap	$8^\circ/18^\circ$ (NLE $13^\circ/20^\circ$)
6.	Speed	170kt
7.	Descent profile	Control with pitch control
8.	Mode selector	LOC/VOR on intercept heading

ILS Coupling - Localiser followed by glidepath:

1.	Heading control	When established - fixed lubber
2.	G/S Auto	Select
3.	Gear	Select when approaching the glidepath
4.	Speed	160kt
5.	G/S Man	Select when on glidepath if G/S Auto not selected
6.	A/P annunciator	Check G/S
7.	Pitch command control	Set 10^0 nose up

ILS Coupling - Glidepath followed by localiser:

1.	Gear	Select when approaching the glidepath
2.	Pitch control	Use to maintain GP
3.	Headings	Use turn control for close coupling
4.	G/S Man	Select when established on GP
5.	Glidepath annunciator	Check G/S
6.	Pitch command control	Set 10^0 nose up

B1-11 except 400 & 539:

1.	Autothrottle	If required. Select speed readout - check against P1 ASI. Engage switch - 'Engage', held
2.	Speed (Flap 26°)	'Dial to achieve' V_{AT}+20kt
3.	Speed (Flap 45°)	'Dial to achieve' V_{AT}+10kt

NOTE Autothrottle may be engaged after Flap 45^0 selected.

Final Approach (Glide Gearing)

Between 1200ft & 800ft, with the speed stabilised at $V_{AT}+10$:

4.	Glide Gearing	Select
5.	A/P annunciator	Check Glide
6.	LFA annunciator	Check Glide

7. Disconnect A/P at or before min disengage height.
8. Disconnect A/Throt before flare.

Final Approach (Prime Land)

Between 1200ft & 800ft, with the speed stabilised at $V_{AT}+10$:

4.	Prime Land	Select
5.	A/P annunciator	Check Land
6.	LFA annunciator	Check Glide

At 400ft R:

7.	LFA annunciator	Check ARM

At 100ft R:

8.	LFA annunciator	Check Attitude

At 50ft R:

9.	LFA annunciator	Check Flare/Retard

On Touchdown

10	A/P & A/Throt	Disengage

B1-11 400 & 539 a/c only:

Cat 2 Approach

Between 1200ft & 800ft with the speed stabilised at $V_{AT}+10$:

1.	Cat 2	Select
2.	A/P annunciator	Check C2

Cat 1 Approach

Between 1200ft & 800ft with the speed stabilised at $V_{AT}+10$:

1.	Cat 1	Select
2.	A/P annunciator	Check C1

Final Approach

1. Disconnect A/P at or before min disengage height.

NON-PRECISION APPROACHES

LLZ ONLY & VOR

1.	Nav receivers	As required for procedure
2.	LLZ only approach	Inhibit GPWS G/P
3.	Course Control	ILS QDM or VOR inbound QDM
4.	Radio Transfer Switch	Normal or as req'd if two separate nav facilities in use
5.	Flap	8°/18° (NLE 13°/20°)
6.	Speed	170kt
7.	Descent profile	Control with pitch control
8.	Headings	Use heading control or turn control
9.	Mode selector	LOC/VOR on intercept heading
10.	Gear	Select when approaching the glidepath
11.	Speed	160kt

Final approach:

12.	Heading marker	Under fixed lubber
13.	Speed (Flap 26°)	V_{AT}+20kt
14.	Speed (Flap 45°)	V_{AT}+10kt
15	Power	Adjust to maintain descent profile

16 Disconnect A/P at or before lowering 45° flap or 1000ft, whichever is higher.

If Cloud break only, to be followed by a visual circuit, maintain 18° (NLE 20°) flap, gear down, 160kt.

ADF

1.	ADF receivers	Required frequency. Check and monitor throughout approach
2.	Course Control	Inbound QDM
3.	Flap	8°/18° (NLE 13°/20°)
4.	Speed	170kt
5.	Descent profile	Control with pitch control
6.	Headings	Use heading control or turn control
7.	Gear	Select when approaching the glidepath
8.	Speed	160kt
Final approach:		
9.	Heading marker	Under fixed lubber
10.	Speed (Flap 26°)	V_{AT}+20kt
11.	Speed (Flap 45°)	V_{AT}+10kt
12	Power	Adjust to maintain descent profile

13. Disconnect A/P at or before lowering 45° flap or 1000ft, whichever is higher.

If Cloud break only, to be followed by a visual circuit, maintain 18° (NLE 20°) flap, gear down, 160kt.

Handler monitors

FCS PROCEDURES

The following recommended procedures are designed to achieve maximum use of the FCS and automatics. The FD must be used (if serviceable) during ILS approaches.

PRE TAKE-OFF SET-UP

To be called out by the handling pilot and actioned by both pilots:

1.	Compass switch	As required.
2.	Az master switch	On.
3.	Check remaining FCS Controller switches in-line with engraved markings.	
4.	F/D pitch selector	Fully up.
5.	Attitude director	Erected, fail flag clear. F/Dir index parked, flag showing.
6.	Drift index	Under fixed lubber, drift shutter closed.
7.	Compass controller	'Comp'. DG flag clear, synchronise. Cross-check RMI's and E2B.
8.	Radio coupling switch	'Steer'.
9.	Track pointer head	Runway QDM/outbound radial.
10.	Setting knob	Out.
11.	Steering index	Runway QDM
12.	Radio input switch	As required.
13.	Displays	Similar or as required. It is permissible to split displays.
14.	Altitude Alert	As required.

FLIGHT DIRECTOR

The handling pilot may call for the Flight Director after the noise abatement cut-back, and thereafter adjust the pitch selector to correspond to steady flight conditions. The monitoring pilot will make FD selections as requested. If there are any doubts about the validity of the FD presentation, the FD must be selected off. The FD must be used (if serviceable) during ILS approaches.

AFTER TAKE-OFF

1.	FD switch	On after Noise Abatement cut-back.
2.	Track pointer head	Reqd track.
3.	Steering index	Reqd heading.
4.	Radio input switches	As required.
5.	Coupling switch	To 'Track' when required.
6.	Height and speed	Fly aircraft manually, and control on power settings.

AFTER NOISE ABATEMENT CLIMB, CLIMB POWER SET

1.	A/P trim indicators	Check in line.
2.	Select speed	Check against ASI
3.	A/P engage switch	'Engage', held, check M.I.
4.	Az master switch	On.
5.	F/D switch	On.
6.	IAS/Throt switch	'IAS', held.
	Speed engage switch	'Engage', held.
	Pitch control may be used to accelerate to the required climb speed.	
7.	Select height	To cleared altitude/FL.
	Select pressure	QNH or 1013 mb.
	Height acq/lock switch	'Acquire'.
	Height engage switch	'Engage', held.

DURING CLIMB

8.	Stbd compass	As reqd.
9.	Compass switch	As reqd.
10.	Speed control	As reqd.
	It is permissible to maintain a Mach No. by the use of the pitch control.	

LEAVING AN INTERMEDIATE LEVEL

Either:

11.	IAS/Throt switch	'IAS', held.
	Speed engage switch	'Engage', held.
	Speed selector	Reduce dialled speed several knots.
	CLimb power	Apply.
	Speed	Control as in 6 and 10 above.
12.	Height acquire	Select as in 7 above.

Or:

11.	Height engage switch	Off.
	Climb power	Apply.
	Pitch control	Use to set climb attitude
	Speed	Control as in 6 and 10 above.
12.	Height acquire	Select as in 7 above

FINAL CLIMB

13.	Mode indicators	'Acq'.
14.	IAS/Throt switch	Drops to 'Throt'
15.	A/Throt cut-out button	Press, mode ind blank. Set reqd power to maintain IAS/Mach No.
16.	Height acq/lock switch	Drops to 'Lock', 'Ht' shown in mode indicator.

Approaching the cleared level it is permissible to select the speed engage switch to Off, prior to commencement of the 'Acquire' phase.

PRIOR TO DESCENT (PRIME LAND APPROACH)

1.	Autopilot status placards	As appropriate.
2.	Radio altimeter	Test. Press test button and check that both instruments indicate approx 30ft with fail flags in view. Test the 'below DH' warning lamp.
3.	Auto Flare Computer	Test. Press test button and check cross hatch appears in MI. Release button and check MI returns to black. Must be serviceable if carrying out an autoland.
4.	IFM	Clear.
5.	Nav 1, Nav 2, FD, auto-pilot	Check serviceability.
6.	Power fail warning lamp	Out.

DESCENT

1.	Power	Reduce by 500 rpm approx.
2.	IAS/Throt switch	'IAS'.
	Speed engage switch	'Engage', held.
3.	Speed selector	Increase dialled speed by 2-3kt.
4.	Power	Descent setting.

Alternatively, descent may be initiated using the pitch wheel and the speed lock engaged when the speed has stabilised.

5.	Select pressure	QNH or 1013 mb.
6.	Select height	Cleared altitude/flight level.
7.	Height acq/lock switch	'Acquire'.
8.	Height engage switch	'Engage', held.

At cleared altitude/Flight level:

9.	IAS/Throt switch	Drops to 'Throt'.
10.	Height acq/lock switch	Drops to 'Lock','Ht' displayed on mode indicator.
11.	A/Throt cut-out button	Press. Mode indicator window blank. Control speed with power

Approaching the cleared level it is permissible to select the speed engage switch to Off, prior to commencement of 'Acquire' phase.

HOLDING AT 210 kt

1.	Autothrottle	Select Speed readout - check against P1 ASI.
	IAS/Throt switch	'Throt'.
	Speed engage switch	'Engage', held.

It is permissible to hold using manual throttle control.

When cleared to lower altitude/flight level:

1.	Power	Reduce by 500 rpm approx.
2.	IAS/Throt switch	'IAS'.
	Speed engage switch	'Engage', held.
3.	Speed selector	Increase dialled speed by 2-3kt.
4.	Rate of descent	Control with power.
5.	Select pressure	QNH or 1013 mb.
6.	Select height	Cleared altitude/flight level.
7.	Height acq/lock switch	'Acquire'.
8.	Height engage switch	'Engage', held.

At cleared altitude/flight level:

9.	IAS/Throt switch	Drops to 'Throt'.
10.	Height acq/lock switch	Drops to 'Lock', 'Ht' displayed on mode indicator. Control speed with power.

PRIOR TO APPROACH

1.	Autothrottle (if required)	Check. Select Speed readout - check against P1 ASI. IAS/Throt switch - 'Engage', held.

STANDARD ILS APPROACH

Initial Approach/Descent to ILS:

1.	Nav Receivers	1 & 2 to ILS frequency unless VOR radials or DME required. Both sets must be selected to ILS frequency once established and normally by a range of 10-12nm from the RWY threshold.
2.	Radio input switches	As required for intermediate approach procedure, then port Nav 1, stbd Nav 2.
3.	Track pointer Heads	As required for intermediate approach procedure, then ILS QDM.
4.	Speed	240-210 kt, a/c clean, according to track miles to run.
5.	Flap	Select $8^{o}/18^{o}$
6.	Speed	Reduce to 170kt.
7.	Autothrottle	Engage for serviceability check if an autoland is planned. Select Speed readout - check against P1 ASI IAS/Throt switch - 'Engage', held.
8.	Descent to ILS	Power - Descent, IAS/Throt switch -'IAS', Speed engage switch - 'Engage', held. Rate of descent - control with power. Select height and pressure setting, Height acq/lock switch - 'Acquire', Height engage switch - 'Engage', held.

ILS Coupling:

Localiser followed by Glidepath:

1.	Radio coupling switch	TPH (when appropriate - usually when within one dot of localiser).
2.	Steering index	To TPH if necessary (during Auto-capture), then fixed lubber when established.
3.	G/P Auto	Select when 'Beam' shows on mode indicator, provided Ht Acquire is not selected.

4.	G/P Man	If G/P Auto not used, select at half dot 'fly-up' with flap and speed selections as for G/P Auto.
5.	Flap	Select/check 18°.
6.	Speed	At G/P capture, select gear down and reduce to 160 kt.
7.	FD pitch selector	Set 10° up.
8.	Flap	Select 26° descending through 2000ft QFE, and reduce to V_{AT}+20kt.
9.	Autothrottle	Select Speed readout - check against P1 ASI IAS/Throt switch - 'Throt', Speed engage switch - 'Engage', held.
10.	Flap	Select 45° descending through 1500ft QFE, and reduce to V_{AT}+10kt.

Note: Autothrottle may be engaged after Flap 45° selected.

Glidepath followed by Localiser:

1.	Flap	Select/check 18° at 170 kt.
2.	Speed	At G/P interception select gear down, and reduce to 160kt.
3.	A/P pitch control	Use to maintain G/P.
4.	Height acquire	Select OM height or 1000ft QFE, whichever higher.
5.	G/P Man	Select when 'Beam' displayed in mode indicator.
6.	FD pitch selector	Set 10° up.
7.	Flap	26° when descending through 2000ft QFE, reduce to V_{AT}+20kt.
8.	Autothrottle	Select Speed readout - check against P1 ASI IAS/Throt switch - 'Throt', Speed engage switch - 'Engage', held.
9.	Flap	Select 45° descending through 1500ft QFE, and reduce to V_{AT}+10kt.

Note: Autothrottle may be engaged after Flap 45° selected.

Final Approach (Glide Gearing):

Between 1200ft & 800ft, with the speed stabilised at $V_{AT}+10$:

10. Glide Gearing	Select. Check: Land annunciator - GLD. Mode indicator lights. Beam and GP flags steady.
11. Autopilot	Disengage at min A/pilot disengage ht. A/P MI - check Off.

Final Approach (Prime Land):

Between 1200ft & 800ft, with the speed stabilised at $V_{AT}+10$:

10. Prime Land	Select. Check: Land annunciator -GLD. Mode indicator lights. Beam and GP flags steady.

At 400ft R:

11. Land Annunciator	Check ARM displayed, cross-check radio height.

At 100ft R:

12. Land Annunciator	Check change from ARM to ATT.

Manual Landing:

At 50ft ARTE:

13. Autopilot	Disengage. A/P MI - check Off.
14. Autothrottle	If in use disengage when crossing the threshold.

Autoland:

At 50ft R:

13. Land annunciator	Check changes from ATT to Blank.

On Touchdown:

14. Autopilot, autothrottle	Disengage.

MANUAL ILS

1. Mode indicators, Beam/GP flags	Checked at 1200-1000 ft.
2. Mode indicators	Flight director in use - Indications normal No flight director - No mode indications. Autothrottle - 'Throt' always displayed when engaged.

NON-PRECISION APPROACHES

LLZ ONLY, & VOR

1.	Nav receivers	As required for procedure, then both to ILS or VOR frequency unless a separate DME is required. LLZ Only - inhibit GPWS GP.
2.	Radio input switches	As reqd for intermediate approach, then port Nav 1, stbd Nav 2.
3.	Track pointer heads	LLZ Only: as reqd for intermediate approach, then ILS QDM. VOR: as reqd intermediate approach (e.g. reciprocal of outbound QDR), then inbound QDM.
4.	Speed	240-210 kt, a/c clean, according to track miles to run.
5.	Flap	Select $8^\circ/18^\circ$.
6.	Speed	Reduce to 170kt.
7.	Autothrottle	If reqd, Select Speed readout - check against P1 ASI IAS/Throt switch - 'Throt', Speed engage switch - 'Engage', held.
8.	Descent	As ILS.
9.	Intercept heading	Gear down, reduce to 160kt.
10.	Radio coupling switch	When established - TPH
11.	Descent	Use speed lock or pitch control with or without autothrottle and acquire the final approach fix altitude/height or 1000ft QFE, whichever is higher. Use DME, if available, to assess rate of descent.
12.	Flaps	Select 26° when descending through 2000ft or when established on final approach, level or descending and before reaching final approach fix. Reduce to V_{AT}+20kt.

13.	Autothrottle	If reqd, IAS/Throt switch - 'Throt', Speed engage switch - 'Engage', held.
14.	Autopilot	Disengage before lowering 45° flap or descending below 1000ft QFE, whichever is higher.
15.	Flap	Select 45° at final approach fix or earlier if a continuous descent is to be accurately flown by reference to DME. Reduce to V_{AT}+10kt.
16.	Steering index	VOR: under fixed lubber.
17.	Radio coupling switch	VOR: 'Steer' at 1000ft. LLZ Only: leave at 'Track'.
18.	Autothrottle	Disconnect when crossing threshold.

ADF APPROACH

1.	ADF receivers	Required frequency.
2.	Radio input switches	As reqd for intermediate approach, then Off.
3.	Track pointer head	As reqd for intermediate approach, then inbound QDM.
4.	Flap, speed, height acquire, autopilot, autothrottle	As LLZ Only and VOR approaches above.

Fan Intake Sw. } Behind
Grd Cond: Fan Sw. } P.1.

INTENTIONALLY LEFT BLANK

CONTENTS

LIMITATIONS 2-1-i

EMERGENCY DESCENT 2-1-1

UNPRESSURISED FLIGHT 2-1-1

SLOW DEPRESSURISATION \ FAILURE TO PRESSURISE 2-1-2

OVER PRESSURISATION 2-1-2

AIR SYSTEM FAILURE SYMPTOMS 2-1-3

AIR SYSTEM FAILURE 2-1-4

DOUBLE AIR SYSTEM FAILURE 2-1-5

AIR CONDITIONING SYSTEM OVERHEAT 2-1-6

FUSELAGE DUCT FAILURE 2-1-6

AIR SYSTEM ELECTRICAL CONTROL FAILURE 2-1-7

MASTER VALVE CONTROL FAILURE 2-1-7

DESPATCH WITH U/S COOLING FAN 2-1-8

DESPATCH WITH MANUAL PRESSURISATION CONTROL 2-1-9

DESPATCH WITHOUT PRESSURISATION 2-1-10

DESPATCH WITH U/S AIR SYSTEM 2-1-11

DESPATCH WITH U/S AIR CONDITIONING SYSTEM 2-1-13

DESPATCH WITHOUT APU SEE ENGINES

INTENTIONALLY LEFT BLANK

LIMITATIONS

Maximum differential pressure (discharge valve)	7.5psi.
Absolute maximum differential pressure (safety valve)	8.0psi.
Discharge valve emergency pressure control setting	9000ft. (approx)
Cabin Altitude warning	10000ft.
Cabin and flight deck temperature control range	65°-85°F.
Mains temperature - normal range (May be exceeded under conditions of extreme OAT and/or power.)	180°-230°C.

Minimum duct pressure required to maintain adequate cabin ventilation with or without airframe anticing.

Two Engines - 20 psi.
One Engine - 38 psi.

AIR SYSTEM FAILURE

Maximum Altitude after single Air System failure in flight:

APU serviceable - 25000ft.
APU unserviceable - 22000ft.

A single pneumatic supply (excluding APU) is capable of providing One Air Conditioning system and one Airframe Antice system (one master valve and one airframe wing and tail antice valve open with the Crossfeed valve open if either are NOT on the same side as the available air supply).

AIR CONDITIONING SYSTEM FAILURE

Maximum Altitude after single Air Conditioning System failure in flight	22000 ft

FAN INTAKE SHUTTERS

Fan Intake switch (if fitted) must be set to 'Shut' if taking-off or landing in snow, slush, or deep standing water.

CONDITIONING FROM MAIN ENGINES DURING TAKE-OFF AND LANDING

Take-off - The maximum take-off weight calculation must include the reduction for Cabin Bleeds On.

The Standard Thrust Index is derived from the Cabin Bleeds On Take-off Thrust Index tables. Thrust reduction is allowable if the normal criteria are met.

Landing - To ensure adequate go-around performance in all circumstances, engine air must not be used for conditioning during landing if the surface temperature is above 25°C and:-

OLE	Aerodrome Elevation exceeds 2200 ft
NLE	Aerodrome Elevation exceeds 950 ft

OPERATION OF AIR CONDITIONING SYSTEM ON THE GROUND

A pilot or qualified engineer must remain on the aircraft if the air conditioning system is in operation.

Whenever passengers are on board the aircraft and the air conditioning system is in use, a pilot or qualified engineer must remain on the flight deck.

Air Conditioning must not be used while de-icing is in progress.

RED MWS FUNCTIONS

Cabin altitude more than 10000ft.

AMBER MWS FUNCTIONS (S1-11 only)

Air system failure
Fuselage duct failure
Airconditioning overheat

OXYGEN

Aircraft fitted with Drop Out Flight Deck Oxygen Masks (S1-11 and 501/515/530 Series)

FLIGHT CREW
Up to 10,000ft, minimum acceptable contents are:-
3/8 full (S1-11)
410 psi (B1-11)
Above 10,000 ft, minimum acceptable contents are:-
3/4 full (S1-11)
750 psi (B1-11).

(On the S1-11 gauge there is a red mark at 3/4 position. 3/8 position is midway between 3/4 and zero.)

NOTE - The 3/8 / 410 psi minimum requirement provides 15 mins smoke protection for flight crew (ANO).

CABIN CREW
Above 10,000ft, portable equipment essential for each non-supernumary crew member.

PASSENGERS
Minimum acceptable contents are:-
3/4 full (S1-11)
750 psi (B1-11)

Therapeutic masks are essential for 10% of passengers for flight above 10,000ft and 15% of passengers for flight above 30,000ft.

Aircraft fitted with Quick Don Sierra Masks (400/523/528/539 Series)

FLIGHT CREW
Minimum acceptable contents on crew gauge is 1200psi.

NOTE - This minimum requirement provides 15 mins smoke protection for flight crew (ANO).

CABIN CREW
Above 10,000ft portable equipment essential for each non-supernumary crew member.

PASSENGERS
Minimum acceptable contents on passenger gauge is 1200psi.

Therapeutic masks are essential for 10% of passengers for flight above 10,000ft and 15% of passengers for flight above 30,000ft.

S1-11 OXYGEN

Normal supply pressure	40psi.
Duration from 'Reserve', all crew and passenger masks in use	35min. approx
'Drop-out' supply pressure	100psi.
Duration from 'Reserve', all crew and passenger masks in use	17min. approx.

A/C WITH DROP DOWN OXYGEN

'Drop-out' cabin altitude	14400ft ±500ft
Intermittent hooter	14400ft ±500ft

PORTABLE OXYGEN

Duration of 120 litre cylinder from full	35 minutes

PRECAUTIONS WHEN OXYGEN IN USE IN THE CABIN

Passengers must not smoke 2 rows forward or aft or in the 3 seats either side of the seat where oxygen is in use.

NOTE 1. The aisle counts as one seat.
2. Air vents should be opened to increase air circulation.

EMERGENCY DESCENT

NOTE: On a/c not fitted with drop down oxygen, the oxygen panels must be set to ON, 100%, emergency flow OFF.
On B1-11 a/c the microphone selectors must be set to mask.

S1-11 - The recommended descent technique for S1-11 a/c is to leave the autopilot engaged, close the throttles, select speedlock and increase the selected speed.

OXYGEN	ON
THROTTLES	CLOSE
DESCENDING TURN	INITIATE
SPEED BRAKE	20^0

SPEED	VMO/MMO
ATC/TRANSPONDER	ADVISE/ A7700(IF REQ)
SAFETY HEIGHT	CHECK
CABIN SIGNS	ON
PASSENGER OXYGEN	ON

When safe to move around aircraft:-

"THE DESCENT IS NOW COMPLETE, WILL THE SENIOR CABIN CREW MEMBER REPORT TO THE FLIGHT DECK "

CABIN CREW	BRIEF

Inspect aircraft for damage

Refer to UNPRESSURISED FLIGHT if appropriate ▨ ✓ See further Checks.

Divert if necessary

Arrange medical for pax & crew on landing

UNPRESSURISED FLIGHT

If due to structural defect (e.g. cracked window):

FASTEN SEAT BELTS SWITCH	ON
AIR CONDITIONING	OPERATE AS NORMAL
AIR DUMP VALVE CONTROL	FULLY OPEN

If due to air supply or air conditioning system defect:

FASTEN SEAT BELTS SWITCH	ON
AIR DUMP VALVE CONTROL	FULLY OPEN
RAM AIR VALVE SWITCH	OPEN

Air conditioning will not be available.

Checklist complete

SLOW DEPRESSURISATION / FAILURE TO PRESSURISE

Cabin altitude climbing, differential decreasing or remaining low.

CABIN ALTITUDE RATE CONTROLLER CHECK

DUMP VALVE INDICATOR CHECK

If OPEN, pressurisation controller has failed:

CABIN SELECTOR LOWER CABIN ALTITUDE

If cabin altitude fails to decrease

DUMP VALVE OPEN SLOWLY

When pressurisation VSI shows increased rate of climb:

PRESS CONTROL CB TRIP
S1-11 & B1-11(400) B53, B1-11(other) B56

DUMP VALVE CLOSE SLOWLY

Achieve the required cabin altitude and thereafter adjust as necessary. The dump valve is extremely sensitive.

If CLOSED, there is a fuselage leak or an air supply failure:

MAINS PRESSURES CHECK

MASTER VALVE SETTING / CBs CHECK
S1-11 & B1-11(400) Sys 1 B219 Sys 2 B146
B1-11(other) Sys 1 B260 Sys 2 B173

GROUND CONDITIONING FAN NORMAL

SAFETY & RAM AIR VALVE SETTINGS CHECK

DOOR WARNING LIGHTS CHECK

If necessary, descend and refer UNPRESSURISED FLIGHT 2-1-1 ▨

OVER - PRESSURISATION

Cabin altitude descending, differential increasing.

CABIN SELECTOR HIGHER CABIN ALTITUDE

If pressure does not decrease:

DUMP VALVE OPEN SLOWLY

When pressurisation VSI shows positive rate of climb:

PRESS CONTROL CB TRIP
S1-11 & B1-11(400) B53, B1-11(other) B56

Achieve the required cabin altitude and thereafter adjust as necessary. The dump valve is extremely sensitive.

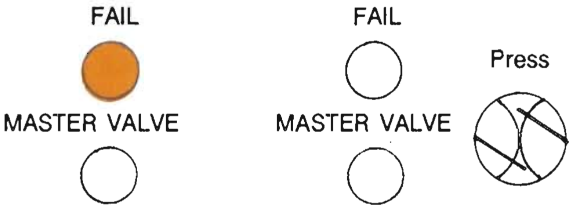
If pressure still does not decrease:

ONE MASTER VALVE CLOSE

Checklist complete

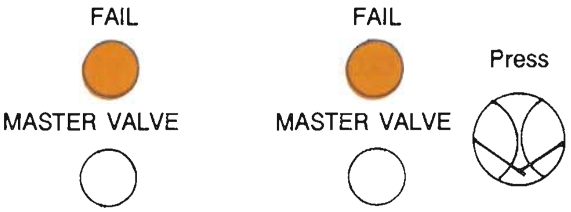
AIR SYSTEM FAILURE SYMPTOMS

AIR SYSTEM FAILURE 2-1-4



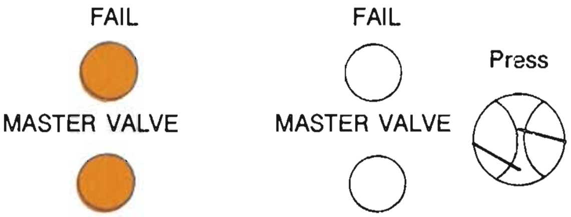
Reduced air flow

DOUBLE AIR SYSTEM FAILURE 2-1-5



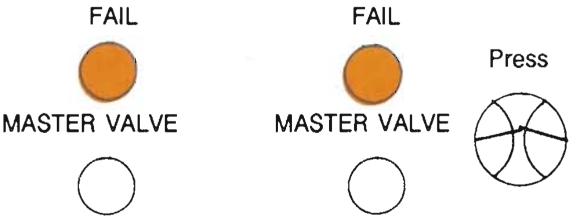
No air flow

AIR CONDITIONING SYSTEM OVERHEAT 2-1-6



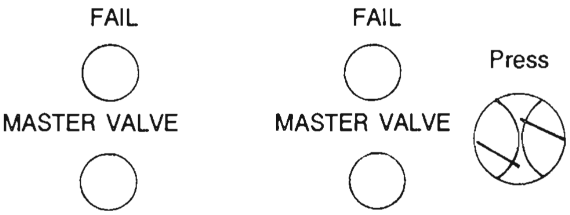
Reduced air flow

FUSELAGE DUCT FAILURE 2-1-6



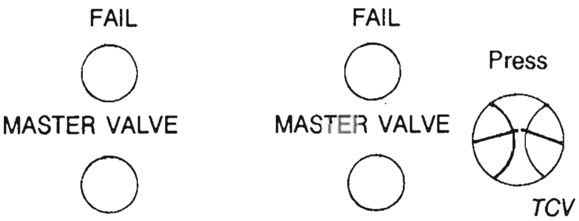
Normal air flow

AIR SYSTEM ELECTRICAL CONTROL FAILURE 2-1-7



Reduced air flow

MASTER VALVE CONTROL FAILURE 2-1-7



Reduced air flow

TCV fully anti-clockwise

AIR SYSTEM FAILURE

System Fail Light ON, Mains Pressure ZERO:

AIR DELIVERY VALVE	CLOSED
MASTER VALVE FAILED SIDE	APU
SYSTEM RESET BUTTON	PRESS
Wait 7 seconds	
MASTER VALVE FAILED SIDE	OPEN
If reset unsuccessful:	
ISOLATION VALVE FAILED SIDE	CLOSE
RESET BUTTON	PRESS - FAIL LIGHT OUT
AIR CROSSFEED	CLOSED
Flight With Air System Unserviceable	
APU	START
MAX ALTITUDE	25000ft (If APU u/s 22000ft)
DUCT PRESSURE	38psi IN LIVE SYSTEM
MASTER VALVES	BOTH OPEN
AIR DEL & CROSSFEED	CLOSED
If wing and tail antice required:	
OPERATIVE SIDE	ON
If an airframe antice valve is u/s, if necessary:	
CROSSFEED	OPEN
ONE MASTER VALVE	CLOSED
OPERATIVE ANTICE VALVE	OPEN

Checklist complete

DOUBLE AIR SYSTEM FAILURE

Both System Fail Lights ON, Mains Pressures Zero:

ANTICIPATE CABIN ALT WARNING & EMERGENCY DESCENT
2-1-1 ▨

AIR DELIVERY VALVE	CLOSED
AIR X FEED VALVE	CLOSED
MASTER VALVES	APU
SYSTEM RESET	PRESS BOTH

Wait 7 Secs

MASTER VALVES	OPEN
DUCT PRESSURES	CHECK

If only one system recovers, continue with AIR SYSTEM FAILURE 2-1-4 ▨

If both system fail lights come on again:

APU	START
DESCEND TO OR BELOW	10000ft
AIRFRAME ANTICE	OFF
ISOLATION VALVES	CLOSE
RESET BUTTONS	PRESS BOTH

When below 17000ft:

AIR DELIVERY VALVE	OPEN
No.1 MASTER VALVE	OPEN

If No.1 system fail light now comes on or if APU u/s APU air not available:

AIR DELIVERY VALVE	CLOSE
DISCHARGE VALVE	OPEN MANUALLY
RAM AIR VALVE	OPEN

If No.1 system fail light remains out, APU air available:

CROSSFEED	OPEN
N0.2 MASTER VALVE	OPEN

CAUTION: AIRFRAME ANTICE NOT AVAILABLE

Checklist complete

AIRCONDITIONING SYSTEM OVERHEAT

Automatic Shutdown: System Fail Light On, Master Valve Light On, Mains Pressure Zero.

MASTER VALVE FAILED SIDE	CLOSE
WARNING LIGHTS	OUT

Wait 10 seconds

MASTER VALVE FAILED SIDE	OPEN or APU

If lights come on again:

MASTER VALVE FAILED SIDE	CLOSE
MAX ALTITUDE	22000ft
MAINS PRESSURE	38psi IN LIVE SYSTEM

If lights remain on or come on again:

ISOLATION VALVE	CLOSE
CROSSFEED VALVE	CLOSE
AIR DEL VALVE *(if No.1 sys)*	CLOSE

NOTE: Airframe anticing not available from failed side.

FUSELAGE DUCT FAILURE

Both System Fail Lights On, Mains Pressures Normal.

CROSSFEED VALVE	CLOSED
ISOLATION VALVES	CLOSE, IN TURN

Wait 2-3 minutes.

Whichever valve causes lights to go out must remain closed.

Flight With Air System Unserviceable:

APU	START
MAX ALTITUDE	25000ft (If APU u/s 22000ft)
MAINS PRESSURE	38psi IN LIVE SYSTEM
MASTER VALVES	BOTH OPEN
AIR DEL. & CROSSFEED	CLOSED

If wing and tail antice required:

OPERATIVE SIDE	ON

CROSSFEED VALVE MUST REMAIN CLOSED

Checklist complete

AIR SYSTEM ELECTRICAL CONTROL FAILURE

Mains pressure(s) zero, no fail warning lights.

CIRCUIT BREAKERS		CHECK
S1-11 & B1-11(400)	Sys 1 B218 Sys 2 B145, B210	
B1-11(other)	Sys 1 B259 Sys 2 B172	

If unable to restore system:

ISOLATION VALVE	CLOSE
APU	START
MAX ALTITUDE	25000ft (If APU u/s 22000ft)
MAINS PRESSURE	38psi IN LIVE SYSTEM
MASTER VALVES	BOTH OPEN
AIR DEL. & CROSSFEED	CLOSED

If wing and tail antice required:

OPERATIVE SIDE	ON

If an airframe antice valve is u/s, if necessary:

CROSSFEED	OPEN
ONE MASTER VALVE	CLOSED
OPERATIVE ANTICE VALVE	OPEN

MASTER VALVE CONTROL FAILURE

Master valve closes, TCV indicates fully anti-clockwise, reduced ventilation, mains pressures normal.

CIRCUIT BREAKERS		CHECK
S1-11 & B1-11(400)	Sys 1 B219 Sys 2 B146	
B1-11(other)	Sys 1 B260 Sys 2 B173	

If unable to restore system:

MASTER VALVE FAILED SIDE	CLOSE
MAX ALTITUDE	22000ft
MAINS PRESSURE	38psi IN LIVE SYSTEM

Checklist complete

DESPATCH WITH U/S COOLING FAN

Cabin air supplies must only be used in the air after take-off and prior to 1500ft on final approach; use of cabin air at other times or on the ground will cause excessive heat and smell in the cabin, and possibly damage the airconditioning heat exchangers.

Before Engine Start:

Ground Cooling Fan supply CB B 21	Trip
Cooling fan switch	Normal
Master Valves	Both Closed
Cabin selector	Set at least 1500ft above airfield altitude

After Engine Start and for Taxying:

Air delivery valve	Close
Air crossfeed valve	Close
Master Valves	APU
Dump Valve	Fully open

After Take-Off, After Noise Cutback:

No. 2 Master valve	Open
Wait 2 sec:	
No. 1 Master valve	Open
Dump Valve	Close slowly

NOTE: In the event of an engine failure, delay these selections until 1500ft QFE.

Descent:

Cabin selector	Set 1500ft above airfield

At 1500ft On Final Approach:

Air del and crossfeed valves	Check shut
Master Valves	APU

NOTE: Do NOT introduce air conditioning after landing.

DESPATCH WITH MANUAL PRESSURISATION CONTROL

Before Departure:

Cabin Press Ctl Amp CB S1-11 & B1-11(400) B53, B1-11(other) B56	Trip.
Dump Valve control	Fully Open.

After 500ft:

Dump valve	Shut slowly to control pressurisation in conjunction with cabin rate-of-climb indicator and pressure gauge.

Descent:

Dump valve	Open slowly, monitoring cabin rate-of-climb indicator and pressure gauge (valve to be fully open at airfield height + 500ft).

NOTE: Should manual pressurisation control be necessary in flight, always take up slack in dump valve cable (ie establish a cabin rate of climb) before tripping circuit breaker.

DESPATCH WITHOUT PRESSURISATION

Before operating unpressurised consider:-

1. MSA/SSA.
2. Acceptability of required cabin ROC/ROD.

In addition should air supplies/airconditioning not be available, consider:-

1. Expected icing conditions.
2. Expected cabin temperature en route.

Limitations

MAX ALTITUDE	10000ft
MAX RATE CLIMB/DESCENT - WHERE POSSIBLE	500ft/min

Procedure

If due to structural defect (e.g. cracked window):

FASTEN SEAT BELTS SWITCH	ON
AIR CONDITIONING	OPERATE AS NORMAL
AIR DUMP VALVE CONTROL	FULLY OPEN

If due to air supply or air conditioning system defects:

FASTEN SEAT BELTS SWITCH	ON
AIR DUMP VALVE CONTROL	FULLY OPEN
RAM AIR VALVE SWITCH	OPEN

(Air conditioning will not be available).

DESPATCH WITH U/S AIR SYSTEM

Airframe anticing requirements should be considered when operating with an unserviceable air system.

The APU should be running to provide system back up.

Altitude Restrictions:

If an Air system is unserviceable prior to flight:

15000ft (APU serviceable)
10000ft (APU unserviceable)

Operate as normal except:

After Take-off (at 1500ft QFE)

NO.2 MASTER VALVE	OPEN
NO.1 MASTER VALVE	OPEN
AIR CROSSFEED VALVE	CLOSE
AIR DELIVERY	CLOSE
MAINS PRESSURE	38 psi IN LIVE SYSTEM

If anticing required:

ENGINES	ON
AIRFRAME - SIDE WITH OPERATIVE SUPPLY	ON

If an airframe antice valve is u/s, if necessary:

CROSSFEED	OPEN
ONE MASTER VALVE	CLOSED
OPERATIVE VALVE	OPEN

FOR FAILURES WHEN OPERATING WITH ONE AIR SYSTEM U/S SEE OVER

AIR CONDITIONING SYSTEM FAILURE WHEN OPERATING WITH AN AIR SYSTEM U/S

NOTE: Following assumes that the serviceable Air System and the Air Conditioning System in use are on the same side.

OVERHEAT OF THE SYSTEM IN USE

Automatic shutdown; System Fail Light On, Master Valve Light On, Mains Pressure Zero, loss of cabin air supply:

ANTICIPATE CABIN ALT WARNING & EMERGENCY DESCENT ▨
2-1-1

MASTER VALVE FAILED AIR COND. SYSTEM	CLOSE
WARNING LIGHTS	OUT
AIR CROSSFEED VALVE	OPEN
MASTER VALVE SERVICEABLE AIR COND. SYSTEM	OPEN

If lights remain on or come on again:

If No 1 air & air conditioning system were in use:

ALL AIR SUPPLIES LOST

If No 2 air & air conditioning system were in use, APU supply available:

When below 17,000 ft:

AIR DELIVERY VALVE	OPEN
No 1 MASTER VALVE	OPEN

MASTER VALVE CONTROL FAILURE OF THE SYSTEM IN USE

Master valve closes, TCV indicates fully anti-clockwise, loss of cabin air supply, mains pressure normal:

ANTICIPATE CABIN ALT WARNING & EMERGENCY DESCENT ▨
2-1-1

MASTER VALVE FAILED AIR COND. SYSTEM		CLOSE
AIR CROSSFEED VALVE		OPEN
MASTER VALVE SERVICEABLE AIR COND. SYSTEM		OPEN
CIRCUIT BREAKERS		CHECK
S1-11 & B1-11(400)	Sys 1 B219 Sys 2 B146	
B1-11(other)	Sys 1 B260 Sys 2 B173	

Checklist complete

DESPATCH WITH U/S AIR CONDITIONING SYSTEM

The MASTER VALVE of the failed system must remain at CLOSED.

Altitude Restrictions:-

If an Air Conditioning System is unserviceable prior to flight, 15,000 ft.

Operate as normal except:-

After engine start:

ISOLATION VALVE ON SIDE OF U/S SYSTEM	CLOSE
AIR CROSSFEED VALVE	OPEN
MASTER VALVE OF SERVICEABLE SYSTEM	APU

After take-off:

ISOLATION VALVES	OPEN
MASTER VALVE OF SERVICEABLE SYSTEM	OPEN
AIR CROSSFEED VALVE	CLOSE
AIR DELIVERY VALVE	CLOSE
MAINS PRESSURE	38psi IN SYSTEM SUPPLYING AIR CONDITIONING SYSTEM

Approach: Use as normal unless APU air is required for conditioning. In this case and for conditioning from APU after landing:

AIR DELIVERY VALVE	OPEN
AIR CROSSFEED VALVE	OPEN
MASTER VALVE OF SERVICEABLE SYSTEM	APU
ISOLATION VALVE ON SIDE OF U/S SYSTEM	CLOSE

If anticing is required:

Operate as normal.

If at any time an overheat condition is indicated on the failed Air Conditioning system, it must be isolated from all air supplies by closing the following:

ISOLATION VALVE ON SIDE OF OVERHEAT	CLOSE
AIR CROSSFEED VALVE	CLOSE
AIR DELIVERY VALVE (If No 1 system failed)	CLOSE

Anticing systems are lost on the side of the failure.

FOR FAILURES WHEN OPERATING WITH ONE AIR CONDITIONING SYSTEM U/S SEE OVER.

AIR SYSTEM FAILURE WHEN OPERATING WITH ONE AIR CONDITIONING SYSTEM U/S

System fail light on, one Mains Pressure zero. No loss of cabin air supply (ie failure of air system on same side as u/s air conditioning system):

ISOLATION VALVE FAILED SIDE	CLOSE
AIR CROSSFEED VALVE	CLOSE
AIRFRAME ANTICING VALVES AFFECTED SIDE	OFF
SYSTEM RESET BUTTON	PRESS

System fail light on, one Mains Pressure zero. Complete loss of cabin air supply:

ANTICIPATE CABIN ALT WARNING & EMERGENCY DESCENT
2-1-1 ▨

ISOLATION VALVE	CLOSE
AIRFRAME ANTICING AFFECTED SIDE	OFF
SYSTEM RESET BUTTON	PRESS
AIR CROSSFEED VALVE	OPEN

Cabin air supply will be reinstated. Only use one wing and one tail anticing system.

DESPATCH WITHOUT APU

See ENGINES

CONTENTS

LIMITATIONS 2-2-i

ENGINE GENERATOR FAILURE 2-2-1

CSDS FAILURE - B1-11 400 SERIES ONLY 2-2-1

AUTO LOAD SHEDDING 2-2-2

TOTAL GENERATOR FAILURE 2-2-3

AC BUS FAILURE - BUS FAIL LIGHT ON 2-2-10

AC BUS FAILURE - BUS FAIL LIGHT AND GENERATOR FAIL LIGHT ON SIMULTANEOUSLY 2-2-10

AC BUS FAILURE - GENERATOR FAIL LIGHT CYCLING ON/OFF WITH BUS FAIL LIGHT ON - POSSIBLY ALTERNATELY 2-2-11

DC FAIL LIGHT ON 2-2-11

TRU FAILURE 2-2-11

OLEO WEIGHT SWITCH FAILURE 2-2-12

DESPATCH WITH MAIN ENGINE GENERATOR/CSDS INOPERATIVE 2-2-13

INTENTIONALLY LEFT BLANK

LIMITATIONS

Generator rating	30 kVA normal. 40 kVA 5 mins only.
Generator 1 & 2 frequency	392 - 408 Hz. ACF defect action in Tech Log if outside these limits.
APU generator frequency	380 - 420 Hz.
Generator voltage	115v nominal.
TRU rating	150A continuous.
DC voltage	28v nominal.
Battery voltage	24v off load.

LANDING LAMPS

Nose landing lamp	Max speed for extension or retraction, 185kts. Max speed with lamp extended, V_{MO}/M_{MO}.
Wing landing lamps	Max speed with lamps extended, and for extension or retraction, - V_{MO}/M_{MO}.

RED MWS OPERATION

DC Fail

AC Bus Fail Nos 1 & 2

AMBER MWS OPERATION (S1-11 only)

Generator Failure

Battery Isolated

INTENTIONALLY LEFT BLANK

ENGINE GENERATOR FAILURE

Generator fail light On

BATTERY	ON
FREQ, VOLTS, KVA	CHECK

If indications normal, disregard warning.

If failure confirmed:

GENERATOR RESET SWITCH	PRESS

If no reset, reduce Engine HP RPM to below 90% (11500).

If still no reset:

NOTE: *If battery only available, a/c must be within APU relight envelope, below FL200, 240kt.*

APU	START
APU FREQ, VOLTS, KVA	CHECK
APU GEN FAIL LIGHT	OUT

IF ONLY ONE GENERATOR REMAINS AVAILABLE, PLAN TO LAND AS SOON AS POSSIBLE.

CSDS FAILURE - B1-11 400 SERIES ONLY

CSDS fail light On. ***NOTE:*** *Only some a/c are fitted with this indication*

BATTERY	ON
FREQ, VOLTS, KVA	CHECK

If indications normal, disregard warning.

If failure confirmed:

CSDS	DISCONNECT

NOTE: *If battery only available, a/c must be within APU relight envelope, below FL200, 240kt.*

APU	START
APU FREQ, VOLTS, KVA	CHECK
APU GEN FAIL LIGHT	OUT

IF ONLY ONE GENERATOR REMAINS AVAILABLE, PLAN TO LAND AS SOON AS POSSIBLE.

Checklist complete

AUTO LOAD SHEDDING

IN FLIGHT

TWO GENERATORS ON LINE:
No.2 aux pump sheds conditioning fan (see note below).
Conditioning fan sheds galley G1 (fwd stbd).
No.1 aux pump sheds galley G2 (aft stbd).

ONE GENERATOR ON LINE:
No.2 aux pump sheds No.1 aux pump (**NOT** B1-11(400)).
All galleys are shed.
Conditioning fan is shed (see note below).

NO GENERATORS ON LINE:
See Total Generator Failure.

NOTE: The shedding of the conditioning fan may cause air conditioning smell at low airspeeds on final approach. If this occurs select the Master Valves to APU and air del and X-feed closed.

ON GROUND

TWO GENERATORS OR GROUND POWER ON LINE:
Conditioning fan sheds galley G1 (fwd stbd).
No.1 aux pump sheds galley G2 (aft stbd) except for one bev maker.

ONE GENERATOR (ENGINE OR APU) ON LINE:
All galleys are shed except for one aft bev maker.

TOTAL GENERATOR FAILURE

MWS flashing, all generator fail lights On, both bus fail lights On:

CAPTAIN ASSUMES CONTROL, FLYING AIRCRAFT MANUALLY.

DC FAIL LIGHT — CHECK ON

If not on:

DC SPLIT CB — TRIP
S1-11 & B1-11(400) P353, B1-11(other) P315

BATTERY SWITCH — ON, CHECK VOLTS/AMPS

GENERATOR RESET SWITCHES — PRESS

If no reset, reduce Engine HP RPM to below 90% (11500). If still no reset:

WATCH — NOTE THE TIME

Speed less than 240kt, altitude less than 20000ft:

APU — START (ONE ATTEMPT)

BATTERY ENDURANCE - The batteries MAY last up to 45 minutes if NO attempt has been made to start the APU, or 40 minutes after ONE unsuccessful attempt. When battery volts fall to 19.5v all remaining electrical services will be lost in 5 mins.

If power is restored, check compass synchronisation.

EMERGENCY LIGHTS - *If airborne and likely to remain so for more than 10 mins* — OFF

B1-11 RECOMMENDED ACTION

Control a/c by reference to FDI, compass indicator, ASI, and VSI. Use VHF 1, NAV 1 and ADF 1. Port RMDI works normally: red/No.1 needle will give the correct RMI presentation. (Green/No.2 needle not available). Use Port course indicator for raw ILS displays by setting course pointer to the lubber line.

Co-pilot control pressurisation manually with the Air Dump Valve. Plan remainder of flight to be at or less than 17000 ft.

S1-11 RECOMMENDED ACTION:

Control a/c by reference to Standby horizon, E2B, ASI, VSI, Turn and Slip. Use VHF 1 and ADF 1 (relative bearings). Blank off Attitude Directors and Flight Compasses as soon as possible.

Co-pilot control pressurisation manually with the Air Dump Valve. Plan remainder of flight to be at or less than 17000 ft.

SYSTEM OPERATION FOLLOWING TOTAL GENERATOR FAILURE

Engines/Fuel

1. Operate normally
2. No indications of fuel flow consumption or fuel temp.
3. No TTC or fuel dip.
4. No fuel transfer. Plan the route using only wing fuel at FL170.
5. No booster pumps - suction feed adequate up to FL180.

Hydraulics

1. Operate normally using EDP's. These cannot be switched off but hydraulic isolate valves will close if fire control handle pulled.
2. Both aux pumps lost.
3. Most hydraulic services remain operative as they are selected manually.
4. DC pump available but would be heavy load on batteries.

Flying Controls

1. Operate normally.
2. Electric elevator trim tab available in Manual Reversion.
3. No Emergency Elevator.

Gear

1. Operates DOWN normally.
2. To select UP use solenoid lock override.
3. Brakes remain operative but no foot brake pressure indication.
4. No standby steering available.

Pressurisation/Air Conditioning

1. Use No.1 system and manual pressure control. Hence plan flight at FL170.
2. There is no temp control or ground conditioning fan.
3. If necessary depressurise aircraft and open ram air valve.

Anticing

1. Engine anticing fed by one of its duplicated supply valves.
2. Wing and tail fed by No.1 system only. Only tail temp indication.
3. Ice detector lost.
4. Only port pitot head remains heated.
5. No windscreen or side window heating.

Stall Protection

Because all vane heaters are lost, inadvertent operations of the stall protection system may occur in icing conditions. If necessary trip 'No 1 Stall Protection' breaker on panel P. S1-11 & B1-11(400) P370, B1-11(other) P332.

S1-11 EQUIPMENT AVAILABLE WITH ALL GENERATORS FAILED

INSTRUMENTS

Port Servo Alt
Port Turn & Slip
S. By Horizon
FL100 W/lt
S. By Alt) Non-electric
P & S VSI's) (Stbd ASI no
P & S ASI's) pitot heat).
E2B Comp)

FLAP

Posn Ind
Normal and emerg
selections available

FLYING CTRLS

Trim tab posn ind
Servo power valve MI
Lift dump control & MI
TPI Ind
Stall ident syst 1
 control & ind
Stall prot syst 1

AIR COND

Fuse duct fail w/lts
Isol valves & syst fail w/lts
No. 1 TCV posn
 (no temp variation)
MV w/lts
Dischge valve ind
 (valve operated manually)
Safety & ram air valves
Cabin alt w/lt
Radio fans fail w/lts

ENGINES

Thrust Gauges
Oil Press gauges
Oil Temp gauges
Oil LP w/lts
TVI's
Reverse unlocked w/lts
HP rpm gauges
TGT gauges

FUEL

Quantity gauges
X feed cock & MI
LP cock & w/lts
APU fuel cock
APU fuel pump
Engine control

ANTICING

Pitot heat port
1 valve per eng
 (No pressure
 indications)
Wings & Tail syst 1
 (no wing temp ind)

ELECTRICS

S. By Inverter
All gen fail w/lts
Bus fail w/lts
MWS & w/lts test
Ground power control

ENG STARTING

Start master
1 & 2 HE Ign
APU start & control

RADIO

VHF 1
ADF 1 (rel bearings)
CCS chan. A
Cabin address
Evacuation alarm

HYDRAULICS

System quant gauge
System press gauge
Brake acc press gauge
Hand brake press gauge
O'heat w/lts
LP w/lts
DC pump
A/Skid (no test)
U/C w/lts & horn

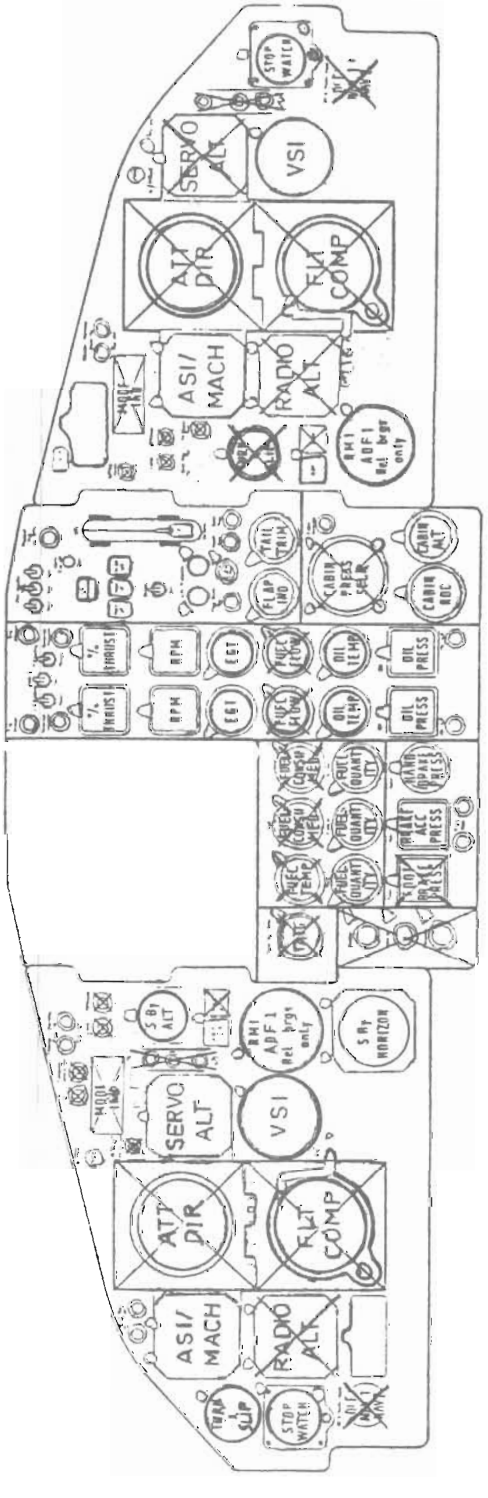
FIRE PROT

All engine fire and
 overheat protection

LIGHTS

Nav
Emergency 1 & 2
Inst panel flood
Compass & Console
Flt deck red flood
Cabin dim
ASI pillar port
 (with Storm switch on)
Stewards call

S1-11 INSTRUMENTS AVAILABLE WITH ALL GENERATORS FAILED



B1-11 EQUIPMENT AVAILABLE WITH ALL GENERATORS FAILED

INSTRUMENTS

Port Compass Indicator
  & red/single pointer
Port Altimeter & w/lt.
S. By Horizon
Port FDI Attitude
S. By Alt & vib.) Non-
Port & Stbd VSIs) electric. stbd
Port & Stbd ASIs) ASI no pitot
E2B Compass) heat.

FLAP

Position indicator
Normal & emergency
  selections available
Shaft failure w/lt

FLYING CONTROLS

Rudder feel fail w/lt
Spoiler isolate system
Trim tab indicator
Config. warning
Lift dump control & MI
TPI Indicator
Stall warning & recognition system 1.
Servo fail w/lts (cut-off
  levers)
S. By elevator trim
  Ctrl & w/lts

AIR COND

Fuse duct fail w/lts
Isol valves & syst fail w/lts
No. 1 TCV posn
  (no temp variation)
Master valve w/lts
Discharge valve indicator
  (manual operation)
Safety & ram air valves
Cabin alt w/lt
X-feed valve indicator
  (not control)

ENGINES

Oil Press gauge
Oil Temp gauge
Oil LP w/lts
EVI's
Reverse unlocked w/lts
Starting circuits
No. 1 Ignitors
APU start & ctrl
disconnect w/lt

FUEL

Quantity gauges
X feed cock & MI
LP cock & w/lts
APU fuel cock & ind
Booster pump LP w/lts
  (but no pumps)

ANTICING

Port pitot heater
Eng 1 & 2 port valves
Airframe systems 1
  & gauge

ELECTRICS

S. By Inverter
All gen fail w/lts
Bus fail w/lts
MWS
Generator ctrl
Batt volt meter
Volt/freq meter
AC Split Cb
CSD discon & fail
  w/lts

FIRE PROT

All fire and overheat
protection systems

FCS & RADIO

VHF1
VHF NAV 1 (VOR/ILS)
ADF 1
Capt & F/O audio
P.A.
Flight service interphone
Evacuation alarm
Altitude Alert &
  port hooter

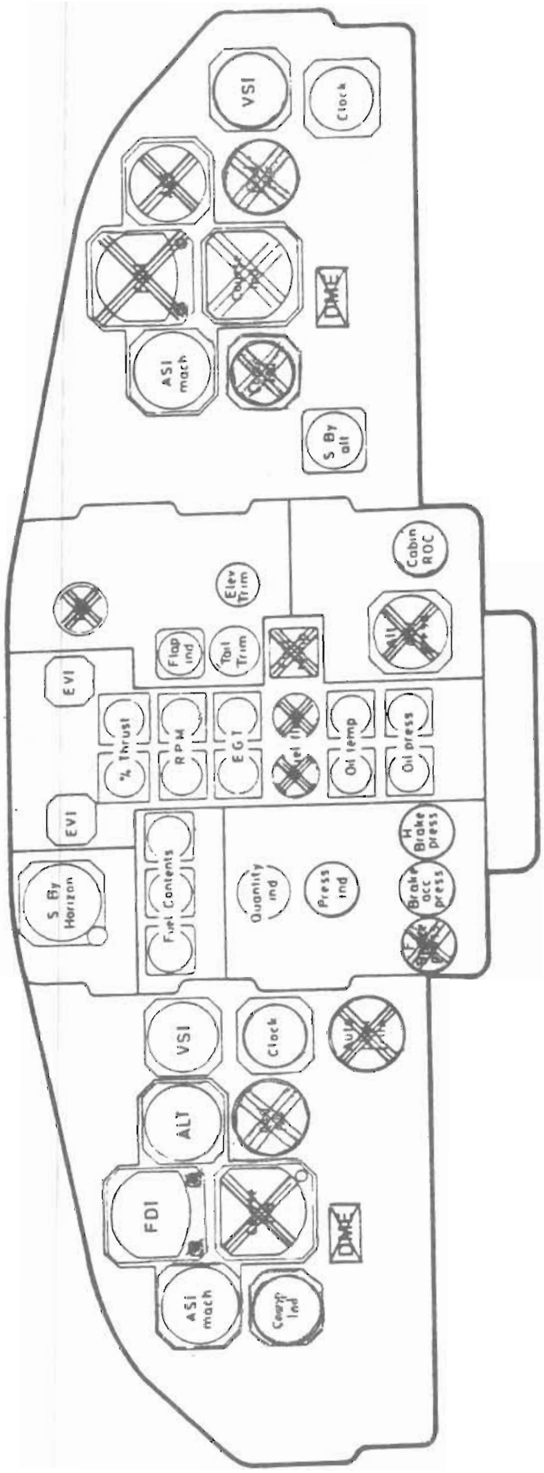
HYDRAULICS

Quantity gauge
Pressure gauge
Brake acc press gauge
Hand brake press guage
Brake Temp gauge
O'heat w/lts
LP w/lts
U/C w/lts & horn
DC pump
Anti-skid (no test)
Isolation valves (thru'
  fire handles)

LIGHTS

Ess, cb panel
Navigation
Emergency 1 & 2 systems
P1 & P2 map table
Compass & Console
Flight Deck red & white
  flood
Flight Deck roof white
E2B Compass
ASI pillar port (with
  white flood selected to
  bright)
Stewards & ground call
  light
Roof panels
VHF 1, ADF, Elev. trim
  controllers

B1-11 INSTRUMENTS AVAILABLE WITH ALL GENERATORS FAILED



TOTAL GENERATOR FAILURE CHECKLIST

AFTER T/O & CLIMB

1.	GEAR	UP, USE MANUAL OVERRIDE
2.	START/RELIGHTS	OFF
3.	AIRCONDITIONING	No.1 MV - OPEN, AIR DEL - CLOSE MANUAL PRESSURISATION CONTROL
4.	ANTICING	ENGINES AS REQ'D (no gauges) No.1 WING & TAIL AS REQ'D
5.	FLAPS	UP
6.	EMERGENCY LIGHTS	OFF

DESCENT

1.	VITAL DATA/BRIEFING	CONFIRMED
	Emergency declared. Make full use of Radar services.	
2.	STANDBY ALTIMETER	SET
3.	PRESSURISATION	MANUAL OPERATION OF DISCHARGE VALVE
4.	FUEL	CHECK (CENTRE FUEL UNUSABLE)

APPROACH

1.	ALTIMETERS	PORT & SBY QNH
2.	SPEEDBRAKE COLLAR	UP
3.	CABIN SIGNS	INOP, BRIEF SCCM
4.	FCS	SET AS REQUIRED
	(B1-11 ILS: Set course pointer to fixed lubber)	

LANDING CHECK

1.	GEAR	DOWN, 3 GREENS
2.	ALTIMETERS	PORT & SBY QFE
3.	BRAKE PRESSURES	ZERO, ACCS 2800, ANTI-SKID ON
	Use normal braking technique on landing	
4.	ANTICING/RELIGHTS	AS REQUIRED
	ENGINES	AS REQUIRED
	WING AND TAIL	OFF
	RELIGHTS	AS REQUIRED
	Only No.1 igniter operative for each engine	
5.	AIR CONDITIONING	DEPRESSURISE
	No.1 MASTER VALVE	CLOSE
	RAM AIR VALVE	OPEN
6.	CABIN CREW	BRIEF SCCM - SIGNAL INOP
7.	FLAPS	FINAL SETTING
8.	EMERGENCY LIGHTS	ON AT 1000ft

GO-AROUND

1.	FULL POWER	SET SLOWLY
	Power may be affected by inop booster pumps	
2.	ATTITUDE & SPEED	ESTABLISH
3.	FLAPS	18°(20°)
4.	GEAR	UP, MANUAL OVERRIDE
5.	ALTIMETERS	PORT AS REQUIRED SBY QNH

AFTER GO-AROUND

AS FOR AFTER TAKE-OFF

AC BUS FAILURE - BUS FAIL LIGHT ON

FREQ, VOLTS, KVA	CHECK

If indications normal, disregard warning

If failure confirmed:

RELEVANT GENERATOR	TRIP

NOTE: *If battery only available, a/c must be within APU relight envelope, below FL200, 240kt.*

APU	START
APU FREQ, VOLTS, KVA	CHECK
APU GEN FAIL LIGHT	OUT

AC BUS FAILURE - BUS FAIL LIGHT & GENERATOR FAIL LIGHT ON SIMULTANEOUSLY

AC SPLIT CB S1-11 & B1-11(400) P361, B1-11(other) P323	OBSERVE DO NOT RESET YET

If AC Split cb not tripped:

GENERATOR	RESET ONCE ONLY

If warnings remain, trip generator and accept loss of associated AC Main Bus.

If AC Split cb tripped:

AC SPLIT CB S1-11 & B1-11(400) P361, B1-11(other) P323	RESET ONCE ONLY
AC BUS FAIL WARNING	CHECK

If warning cancelled:

GENERATOR	RESET

If generator will not reset, start APU and check output.

If warning not cancelled:

GENERATOR	RESET ONCE ONLY

If warnings persist, trip generator and accept loss of associated AC Main Bus Bar.

Checklist complete

AC BUS FAILURE - GENERATOR FAIL LIGHT CYCLING ON/OFF WITH BUS FAIL LIGHT ON - POSSIBLY ALTERNATELY

GENERATOR	TRIP

Services from appropriate Main AC BUS are lost. These are listed in the Technical Manual Electrical section. ▨

All FCS & radio supplies will be normal even though power fail warning light (N/A 400 series) will be on if No.1 main AC bus has failed.

NOTE: If the other engine generator now fails, the APU will not take over. See TOTAL GENERATOR FAILURE 2-2-3. ▨

DC FAIL LIGHT ON

TRU AMMETERS	CHECK

If either or both indicate zero:

TRU CB's Sys 1 B17 Sys 2 B18	CHECK

If either tripped and will not reset, or the TRU remains inoperative, and the DC fail light remains on:

No 2 TRU u/s Main DC and sub bus bars are lost.

No 1 TRU u/s DC SPLIT CB CHECK
S1-11 & B1-11(400) P353, B1-11(other) P315

If fail light remains ON, DC Essential, Battery bus & sub bus bars are available for approx 30 mins.

If both indications normal:

DC SPLIT CB S1-11 & B1-11(400) P353, B1-11(other) P315	CHECK

If not tripped - no further action.

TRU FAILURE

TRU ammeter indicates zero:

TRU CB's Sys 1 B17 Sys 2 B18	CHECK

If either tripped and will not reset, or the TRU remains inoperative, all DC supplies will be maintained by the remaining TRU provided the DC fail light remains out.

Checklist complete

OLEO WEIGHT SWITCH FAILURE

The following symptoms will occur should an oleo switch fail to FLIGHT:

Ice detector	Rotates with a/c on the ground
Configuration warning	Will not test
Stall Protection	Shake and push will not test - system will be 'live' possibly giving spurious operation while on the ground
Flight instruments (S1-11 only)	Standby horizon & turn indicators operate with HP cocks closed.
Flight recorder	Indicates ON
Lift dump	Will not operate
Airframe a/ice	Operates on the ground
Brakes	**When anti-skid selected ON brakes will not operate**
Electrics	Load shedding will be flight mode

LANDING GEAR RELAY CB's **CHECK**
S1-11 & B1-11(400) B242, 243, 244, 245
B1-11(other) B283, 284, 285, 286

The following symptoms will occur should an oleo switch fail to GROUND:

Gear	Gear lever lock remains engaged
Ground conditioning fan	Remains running throughout flight
Configuration Warning	May operate

NOTE: The oleo switch remaining at GROUND may be due to a main gear oleo not extending, see Hydraulics 2-5-27.

▨

DESPATCH WITH MAIN ENGINE GENERATOR/CSDS INOPERATIVE

Operating Limitations

1. Passengers and goods may be carried for hire and reward.

2. APU must be serviceable for in flight use. See APU Limitations - USE OF APU IN FLIGHT (ENGINES 2-3-v).

   Serviceability must be established before each sector by using the following check which will normally be carried out by engineering and the Tech Log annotated accordingly. The procedure below is given to cater for situations where licenced engineering cover is not available.

   (a) With no main engine generator connected to the AC busbars, bring the APU generator on line.

   (b) Observing the APU KVA meter on roof panel E, select electrical loads to the approximate total value of 30 KVA max.
   NOTE: Recommended loads are the ground conditioning fan and aux. hydraulic pumps 1 and 2.

   (c) Select APU air for preferably both systems. Maintain 1 minute and then select off. If, at any time during the above procedure, the APU fails to sustain continuity of electrical supply, the APU must not be considered "Serviceable for in flight use" in the allowable deficiency context.

INTENTIONALLY LEFT BLANK

CONTENTS

ALL ENGINES FAILURE **SEE EMERGENCY PROCEDURES SECTION**

LIMITATIONS 2-3-i

ENGINE FIRE/OVERHEAT & SHUTDOWN 2-3-1

AFTER ENGINE SHUTDOWN 2-3-1

APU FIRE 2-3-2

ENGINE OVERHEAT/FIRE OR APU FIRE ON START 2-3-2

ENGINE MALFUNCTION ON TAKE-OFF 2-3-3

ENGINE FAILURE DURING CLIMB, CRUISE OR DESCENT 2-3-6

ENGINE OUT DRIFT DOWN - ANTICING ON 500 SERIES 2-3-8

ENGINE OUT DRIFT DOWN - ANTICING OFF 500 SERIES 2-3-9

ENGINE OUT DRIFT DOWN - ANTICING ON 400 SERIES 2-3-10

ENGINE OUT DRIFT DOWN - ANTICING OFF 400 SERIES 2-3-11

ENGINE FAILURE DURING APPROACH 2-3-13

ENGINE FAILURE DURING G0-AROUND 2-3-14

ASYMMETRIC APPROACH AND LANDING 2-3-15

IMMEDIATE RELIGHT 2-3-16

ENGINE RELIGHT 2-3-17

OIL PRESSURE LOW 2-3-18

OIL TEMPERATURE HIGH 2-3-18

EXCESSIVE TGT 2-3-18

ENGINE HUNTING OR SURGING 2-3-18

TTC MALFUNCTION 2-3-19

FUEL DIP MALFUNCTION 2-3-19

THRUST REVERSER FAILURE IN FLIGHT 2-3-19

THRUST REVERSER FAILURE ON LANDING 2-3-19

ENGINE VIBRATION 2-3-20

ENGINE - ABNORMAL INDICATIONS DURING START 2-3-21

STARTING WITH EXTERNAL AIR SUPPLY 2-3-23

STARTING MAIN ENGINES WITH A U/S APU GENERATOR 2-3-25

TAIL WIND START 2-3-25

MOTOR-OVER 2-3-25

DESPATCH WITH U/S THRUST GAUGE 2-3-26

DESPATCH WITH U/S THRUST REVERSER(S) 2-3-26

DESPATCH WITH U/S CSDS 2-3-26

APU - FAILURE TO START 2-3-27

APU - LOW OIL PRESSURE 2-3-27

APU - EXCESSIVE EGT 2-3-28

DESPATCH WITH U/S APU 2-3-29